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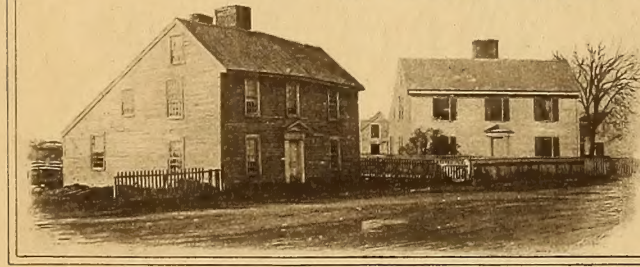

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ENCYCLOPÆDIA.

A.

A, THE firſt letter of the alphabet, in all the known languages of the world, that of Ethiopia excepted, in which it is the 13th. It has deſervedly the firſt place in the alphabet on account of its ſimplicity, very little more being neceſſary to its pronunciation than opening the mouth.

In the Engliſh language A is the mark of three different ſounds, termed, by our grammarians, the *broad*, the *open*, and the *ſlender* A. The firſt reſembles that of the German A, is found in ſeveral monoſyllables, as *wall*, *ſalt*, &c. and is pronounced as *au* in *cauſe*. It is probable that the Saxons expreſſed only this broad ſound of the letter, as it is ſtill commonly retained in the northern diſtricts of England, and univerſally throughout Scotland; as, *tauk* for *talk*, *wauk* for *walk* or *wake*. The open A reſembles that of the Italians in *adagio*, and is the ſame with that of *a* in *father*, *rather*, &c. The ſlender ſound is peculiar to the Engliſh language, and reſembles the ſound of the French diphthong *ai* in *pais*, or their *a* maſculine, or perhaps it is a middle ſound between them: it is exemplified in *place*, *waſte*, &c. alſo in *toleration*, *juſtification*, and all other words ending with *ation*.

A is ſometimes added after words in burleſque poetry; in which caſe it only makes an additional ſyllable without any alteration of the ſenſe, as the interjection O very often does in our ballads. It is alſo ſometimes redundant, as in the words *ariſe*, *awake*, &c. which are not different in ſignification from *riſe*, *wake*, &c.

It is ſometimes a word, either noun or interjection; in which laſt caſe it is commonly an expreſſion of grief, and joined with the aſpirate, as *ah!* When a noun, it is only with reſpect to itſelf; as *great* A, *little* a, &c.

A is very frequently uſed as an article; in which caſe it has no plural ſignification, and is uſed to denote the number *one*, as *a* houſe, *a* field, &c. When placed as an article before any of the vowels, *y* and *w* only excepted, it is joined with the letter *n*; as, *an* iſland, *an* orator, &c. In the three following caſes it is a prepoſition. 1. When it goes before a participle, or noun derived from a participle; as, I am *a* doing this or that. 2. When uſed before local ſurnames, as Cornelius *a* Lapide, Thomas *a* Kempis, &c. 3. When it is uſed in compoſition; as, *a* foot, *a* ſleep, &c. In ſome inſtances it denotes the proportion of one thing to another; as ſo much *a* week, *a* man, *a* head, &c.

A, among the ancients, was a numeral letter, and ſignified 500; and when a daſh was added on the top, Ā, 5000.

A, in the Julian calendar, is the firſt of the ſeven DOMINICAL letters. It had been in uſe amongſt the Romans long before the eſtabliſhment of Chriſtianity, as the firſt of the eight *nundinales litteræ*; in imitation whereof it was that the dominical letters were firſt introduced.

A is alſo an abbreviation uſed with different intentions. Hence,

A, among logicians, is uſed to denote an univerſal affirmative propoſition; according to the verſe,

Aſſerat A, negat E, verùm generaliter ambæ.

Thus, in the firſt figure, a ſyllogiſm conſiſting of three univerſal affirmative propoſitions, is ſaid to be in Bār-bā-rā; the *A* thrice repeated, denoting ſo many of the propoſitions to be univerſal, &c. See BARBARA.

A, among the Romans, was uſed in the giving of votes or ſuffrages. When a new law was propoſed, each voter had two wooden ballots put in his hand; the one marked with a capital *A*, ſignifying *antiquo*, q. d. *antiquam volo*; and the other with *V. R.* for *uti rogas*. Such as were againſt the law, caſt the firſt into the urn; as who ſhould ſay, I refuſe it, I antiquate it; or, I like the ancient law, and deſire no innovation.

A, in the trials of criminal cauſes, alſo denoted abſolution: whence Cicero, *pro Milone*, calls *A*, *littera ſalutaris*, a ſaving letter. Three ballots were diſtributed to each judge, marked with the letters, *A* for *abſolvo*, I acquit; *C* for *condemno*, I condemn; and *N. L.* for *non liquet*, It is not clear. From the number of each caſt into the urn, the prætor pronounced the priſoner's fate. If they were equal in number, he was abſolved.

A, in the ancient inſcriptions of marbles, &c. occaſionally ſtands for *Auguſtus*, *ager*, *aiunt*, &c. When double, it denotes *Auguſti*; when triple, *aurum*, *argentum*, *æs*; and ſometimes its meaning can only be known by the reſt of the inſcription. Iſidore adds, that when it occurs after the word *miles* (ſoldier), it denotes him young. On the reverſe of ancient medals, it denotes them ſtruck by the city of Argos, ſometimes by that of Athens; but on coins of modern date, it is the mark of Paris.

A, as an abbreviation, is alſo often found in modern writers: as, A. D. for *anno Domini*; A. M. *artium magiſter*, maſter of arts, &c.

A, the letter a, with a line above it thus, ā, is uſed in medical preſcriptions for *ana*, of each; ſometimes it is written thus, ā̄ā : e. g. ℞ Mel. Sacchar. & Mann. ā, vel āā, ℥j. i. e. Take of honey, ſugar, and manna, of each one ounce.

A, put to bills of exchange, is in England an abbreviation for *accepted*, and in France for *accepté*. It is likewiſe uſual among merchants to mark their ſets of books with the letters A, B, C, &c. inſtead of the numbers 1, 2, 3, &c.

A. A. A. The chemical abbreviation for Amalgama, or Amalgamation.

AA, the name of ſeveral rivers in Germany and Swiſſerland.

AACH, a little town in Germany, in the circle of Suabia, near the ſource of the river Aach, and almoſt equally diſtant from the Danube and the lake Conſtance. It belongs to the houſe of Auſtria. E. Long. 9. 0. Lat. 47. 55.

AAHUS, a little town in Germany, in the circle of Weſtphalia, and biſhopric of Munſter. It is the capital of Aahus, a ſmall diſtrict; has a good caſtle; and lies north-eaſt of Coesfeldt. E. Long. 7. 1. Lat. 52. 10.

AAM, or HAAM, a liquid meaſure in common uſe among the Dutch, and containing 128 meaſures called *mingles*, each weighing nearly 36 ounces avoirdupoiſe; whence the *Aam* contains 288 Engliſh, and $148\frac{1}{3}$ pints Paris meaſure.

AAR, the name of two rivers, one in Swiſſerland, and another in Weſtphalia in Germany. It is alſo the name of a ſmall iſland in the Baltic.

AARASSUS (anc. geog.), a town of Piſidia, in the Hither Aſia, thought to be the Anaſſus of Ptolemy.

AARON, high-prieſt of the Jews, and brother to Moſes, was by the father's ſide great grandſon, and by the mother's grandſon, of Levi. By God's command he met Moſes at the foot of mount Horeb, and they went together into Egypt to deliver the children of Iſrael: he had a great ſhare in all that Moſes did for their deliverance; the ſcriptures call him the prophet of Moſes, and he acted in that capacity after the Iſraelites had paſſed over the Red Sea. He aſcended mount Sinai with two of his ſons, Nabab and Abihu, and ſeventy elders of the people; but neither he nor they went higher than half way, from whence they ſaw the glory of God; only Moſes and Joſhua went to the top, where they ſtaid forty days. During their abſence, Aaron, overcome by the people's eager entreaties, ſet up the golden calf, which the Iſraelites worſhipped by his conſent. This calf has given riſe to various conjectures. Some rabbies maintain that he did not make the golden calf; but only threw the gold into the fire, to get rid of the importunities of the people; and that certain magicians, who mingled with the Iſraelites at their departure from Egypt, caſt this gold into the figure of a calf. According to ſome authors, the fear of falling a ſacrifice to the reſentment of the people by giving a refuſal, made Aaron comply with their deſire; and they allege alſo, that he hoped to elude their requeſt, by demanding of the women to contribute their ear-rings, imagining they would rather chooſe to remain without a viſible deity, than be deprived of their perſonal ornaments. This affair of the golden calf happened in the third month after the Iſraelites came out of Egypt. In the firſt month of the following year, Aaron was appointed by God high-prieſt; which office he executed during the time that the children of Iſrael continued in the wilderneſs. He died in the fortieth year after their departure from Egypt, upon mount Hor, being then 123 years old; A. M. 2522, of the Julian period 3262, before the Chriſtian æra 1452. With regard to the attempts of the Egyptian magicians to imitate the miracles performed by his rod, ſee ſome remarks under the article MAGICIAN.

Aaron and Julius (Saints), ſuffered martyrdom together, during the perſecution under the emperor Diocleſian, in the year 303, about the ſame time with St. Alban, the protomartyr of Britain. We are nowhere told what their Britiſh names were, it being uſual with the Chriſtian Britons, at the time of baptiſm, to take new names from the Greek, Latin, or Hebrew. Nor have we any certainty as to the particulars of their death; only that they ſuffered the moſt cruel torments. They had each a church erected to his memory; and their feſtival is placed, in the Roman martyrology, on the firſt of July.

Aaron, or *Harun*, *Al Raſchid*, a celebrated khalif, or Mahometan ſovereign of the Saracen empire; whoſe hiſtory is given under the article BAGDAD.

Aaron Hariſchon, a learned rabbi and CARAITE in the 15th century, wrote an Hebrew grammar, printed at Conſtantinople in 1581; probably the ſame with Aaron the caraite, who wrote a commentary on the five books of Moſes, which is in MS. in the French king's library.

AARSENS (FRANCIS), Lord of Someldyck and Spyck, was one of the greateſt miniſters for negociation the United Provinces could ever boaſt of. His father, Cornelius Aarſens, was Regiſter to the States; and being acquainted with M. Pleſſis Mornay, at the Court of William Prince of Orange, he prevailed upon him to take his ſon under him, with whom he continued ſome years. John Olden Barnevelt, who preſided over the affairs of Holland and all the United Provinces, ſent him afterwards agent into France, where he learned to negociate under thoſe profound politicians Henry IV. Villeroy, Silleri, Roſſie, Jaonnin, &c. and he acquitted himſelf in ſuch a manner as to obtain their approbation. Soon after, he was inveſted with the character of ambaſſador, being the firſt who was recogniſed as ſuch by the French court; at which time Henry IV. declared, that he ſhould take precedence next to the Venetian miniſter. He reſided in France 15 years; during which time he received great marks of eſteem from the king, who created him a knight and baron; and for this reaſon he was received amongſt the nobles of the province of Holland. However, he became at length ſo odious to the French court, that they deſired to have him recalled. He was afterwards deputed to Venice, and to ſeveral German and Italian princes, upon occaſion of the troubles in Bohemia. He was the firſt of three extraordinary ambaſſadors ſent into England in 1620, and the ſecond in 1641; in which latter embaſſy he was accompanied by the Lord of Brederode as firſt ambaſſador, and Heemſvliet as third, to treat about the marriage of Prince William, ſon to the Prince of Orange. He was likewiſe ambaſſador-extraordinary to the French court in 1624, and the Cardinal de Richlieu having juſt taken the adminiſtration of affairs into his hands, and knowing he was an able man, made uſe of him to ſerve his own purpoſes. He died in a very advanced age; and his ſon, who ſurvived him, was reputed the wealthieſt man in Holland.

AARSENS (Peter), a painter, called in Italy Pietro Longo, becauſe of his ſtature, was born at Amſterdam 1519. He was eminent for all kinds of ſubjects; but was particularly famous for altar-pieces, and for repreſenting a kitchen with its furniture: he had the pain to ſee a fine altar-piece of his deſtroyed by the rabble in the inſurrection 1566, though a lady of Alcmaer offered 200 crowns for its redemption.

AARTGEN, or AERTGEN, a painter of merit, was the ſon of an woolcomber, and born at Leyden in 1498. He worked at his father's trade until he had attained the age of eighteen; and then, having diſcovered a genius for deſigning, he was placed with Cornelius Engelheihtz, under whom he made a conſiderable progreſs in painting. He became ſo diſtinguiſhed, that the celebrated Francis Floris went to Leyden out of mere curioſity to ſee him. He found him inhabiting a poor half-ruined hut, and in a very mean ſtyle of living: He ſolicited him to go to Antwerp, promiſing him wealth and rank ſuitable to his merit; but Aartgen refuſed, declaring that he found more ſweets in his poverty than others did in their riches. It was a cuſtom with this painter never to work on Mondays, but to devote that day, with his diſciples, to the bottle. He uſed to ſtroll about the ſtreets in the night, playing on the German flute, and in one of theſe frolics was drowned in 1564.

AASAR (anc. geog.), a town of Paleſtine, in the tribe of Judah, ſituate between Azotus and Aſcalon. In Jerome's time it was an hamlet.

AB, the eleventh month of the civil year of the Hebrews, and the fifth of their eccleſiaſtical year, which begins with the month Niſan. It anſwers to the moon of July; that is, to part of our month of the ſame name, and to the beginning of Auguſt: it conſiſts of thirty days. The Jews faſt on the firſt of this month, in memory of Aaron's death; and on the ninth, becauſe on that day both the temple of Solomon, and that erected after the captivity, were burnt; the former by the Chaldeans, and the latter by the Romans. The ſame day is alſo remarkable among that people for the publication of Adrian's edict, wherein they were forbid to continue in Judea, or even to look back when at a diſtance from Jeruſalem, in order to lament the deſolation of that city. The eighteenth of the ſame month is alſo a faſt among the Jews; becauſe the lamp in the ſanctuary was that night extinguiſhed, in the time of Ahaz.

AB, in the Syriac calendar, is the name of the laſt ſummer-month. The firſt day of this month they called *Suum Miriam*, the faſt of the virgin, becauſe the eaſtern Chriſtians faſted from that day to the fifteenth, which was therefore called *Fathr-Miriam*, the ceſſation of the faſt of the virgin.

ABA (or rather ABAU) HANIFAH or HANFAH, ſirnamed Al-Nooma, was the ſon of Thabet, and born at Coufah in the 80th year of the Hegira. This is the moſt celebrated doctor of the orthodox Muſſulmans, and his ſect holds the principal eſteem among the four which they indifferently follow. Notwithſtanding this, he was not very well eſteemed during his life, inſomuch that the khaliff Almanſor cauſed him to be impriſoned at Bagdad, for having refuſed to ſubſcribe to the opinion of abſolute predeſtination, which the Muſſulmans call Cadha. But afterwards Abou Joſeph, who was the ſovereign judge or chancellor of the empire under the khaliff Hadi, brought his doctrine into ſuch credit, that it became a prevailing opinion, That to be a good Muſſulman was to be a Haniſite. He died in the 150th year of the Hegira, in the priſon of Bagdad aforeſaid: and it was not till 335 years after his death, that Melick Schah, a ſultan of the Selgiucidan race, built for him a magnificent monument in the ſame city, whereto he adjoined a college peculiarly appropriated to ſuch as made a profeſſion of this ſect. This was in the 485th year of the Hegira, and Anno Chriſti 1092. The moſt eminent ſucceſſors of this doctor were Ahmed Benali, Al Giaſſas, and Al Razi who was the maſter of Naſſari; and there is a moſque particularly appropriated to them in the temple of Mecca.

ABA, *Abas*, *Abos*, or *Abus*, (anc. geog.), the name of a mountain of Greater Armenia, ſituated between the mountains Niphatos and Nibonis. According to Strabo, the Euphrates and Araxes roſe from this mountain; the former running eaſtward, and the latter weſtward.

ABA. See ABÆ.

ABACÆNA (anc. geog.), a town of Media, and another of Cana in the Hither Aſia.

ABACÆNUM (anc. geog.), a town of Sicily, whoſe ruins are ſuppoſed to be thoſe lying near Trippi, a citadel on an high and ſteep mountain not far from Meſſina. The inhabitants were called *Abacænini*.

ABACATUAIA, in ichthyology, a barbarous name of the zeus vomer. See ZEUS.

ABACH, a market-town of Germany, in Lower Bavaria, ſeated on the Danube. It is remarkable for Roman antiquities, and for ſprings of mineral waters which are ſaid to be good for various diſtempers. E. Long. 11. 56. Lat. 48. 53.

ABACINARE, or ABBACINARE, in writers of the middle age, a ſpecies of puniſhment, conſiſting in the blinding of the criminal, by holding a hot baſon or bowl of metal before his eyes.

ABACK (a ſea-term), the ſituation of the ſails when their ſurfaces are flatted againſt the maſts by the force of the wind. The ſails are ſaid to be *taken aback* when they are brought into this ſituation, either by a ſudden change of the wind, or by an alteration in the ſhip's courſe. They are *laid aback*, to effect an immediate retreat, without turning to the right or left; or, in the ſea-phraſe, to give the ſhip *ſtern-way*, in order to avoid ſome danger diſcovered before her in a narrow channel, or when ſhe has advanced beyond her ſtation in the line of battle, or otherwiſe. The ſails are placed in this poſition by ſlackening their lee-braces, and hauling in the weather ones; ſo that the whole effort of the wind is exerted on the forepart of their ſurface, which readily puſhes the ſhip aſtern, unleſs ſhe is reſtrained by ſome counteracting force. It is alſo uſual to ſpread ſome ſail aback near the ſtern, as the mizzen top-ſail, when a ſhip rides with a ſingle anchor in a road, in order to prevent her from approaching it ſo as to entangle the flukes of it with her ſlackened cable, and thereby looſen it from the ground.

ABACOT, the name of an ancient cap of ſtate worn by the kings of England, the upper part whereof was in the form of a double crown.

ABACTORS, or Abactores, a name given to thoſe who drive away, or rather ſteal, cattle by herds, or great numbers at once; and are therefore very properly diſtinguiſhed from *fures*, or thieves.

ABACUS, among the ancients, was a kind of cupboard or buffet. Livy, deſcribing the luxury into which the Romans degenerated after the conqueſt of Aſia, ſays, They had their *abaci*, beds, *&c.* plated over with gold.

Abacus, among the ancient mathematicians, ſignified a table covered with duſt, on which they drew their diagrams; the word in this ſenſe being derived from the Phœnician *abak*, duſt.

Abacus, in architecture, ſignifies the ſuperior part or member of the capital of a column, and ſerves as a kind of crowning to both. Vitruvius tells us the abacus was originally intended to repreſent a ſquare tile laid over an urn, or rather over a baſket. See Architecture, nº 15. The form of the abacus is not the ſame in all orders: in the Tuſcan, Doric, and Ionic, it is generally ſquare; but in the Corinthian and Compoſite, its four ſides are arched inwards, and embelliſhed in the middle with ſome ornament, as a roſe or other flower. Scammozzi uſes *abacus* for a concave moulding on the capital of the Tuſcan pedeſtal; and Palladio calls the plinth above the echinus, or boultin, in the Tuſcan and Doric orders, by the ſame name.

Abacus is alſo the name of an ancient inſtrument for facilitating operations in arithmetic. It is variouſly contrived. That chiefly uſed in Europe is made by drawing any number of parallel lines at the diſtance of two diameters of one of the counters uſed in the calculation. A counter placed on the loweſt line, ſignifies 1; on the 2d, 10; on the 3d, 100; on the 4th, 1000, &c. In the intermediate ſpaces, the ſame counters are eſtimated at one half of the value of the line immediately ſuperior, *viz.* between the 1ſt and 2d, 5; between the 2d and 3d, 50; &c. See the figure on Plate I. where the ſame number, 1788 for example, is repreſented under both diviſions by different diſpoſitions of the counters.

Abacus is alſo uſed by modern writers for a table of numbers ready caſt up, to expedite the operations of arithmetic. In this ſenſe we have *Abaci* of addition, of multiplication, of diviſion.

Chineſe Abacus. See Swanfan.

Abacus Pythagoricus, the common multiplication-table, ſo called from its being invented by Pythagoras.

Abacus Logiſticus, is a rectangled triangle, whoſe ſides, forming the right angle, contain the numbers from 1 to 60; and its area, the facta of each two of the numbers perpendicularly oppoſite. This is alſo called a *canon of ſexageſimals.*

Abacus & Palmulæ, in the ancient muſic, denote the machinery, whereby the ſtrings of Polyplectra, or inſtruments of many ſtrings, were ſtruck with a plectrum made of quills.

Abacus Harmonicus, is uſed by Kircher for the ſtructure and diſpoſition of the keys of a muſical inſtrument, whether to be touched with the hands or the feet.

Abacus Major, in metallurgic operations, the name of a trough uſed in the mines, wherein the ore is waſhed.

ABADDON, is the name which St. John in the Revelation gives to the king of the locuſts, the angel of the bottomleſs pit. The inſpired writer ſays, this word is Hebrew, and in Greek ſignifies ’Απολλυων, *i. e.* a *deſtroyer.* That angel-king is thought to be Satan or the devil: but Mr. le Clerc thinks, with Dr. Hammond, that by the locuſts which came out of the abyſs, may be underſtood the zealots and robbers, who miſerably afflicted the land of Judea, and laid it in a manner waſte before Jeruſalem was taken by the Romans; and that Abaddon, the king of the locuſts, may be John of Giſchala, who having treacherouſly left that town a little before it was ſurrendered to Titus, came to Jeruſalem, where he ſoon headed part of the zealots, who acknowledged him as their king, whilſt the reſt would not ſubmit to him. This ſubdiviſion of the zealot party brought a thouſand calamities on the Jews.

ABADIR, a title which the Carthaginians gave to gods of the firſt order. In the Roman mythology, it is the name of a ſtone which Saturn ſwallowed, by the contrivance of his wife Ops, believing it to be his new-born ſon Jupiter: hence it ridiculouſly became the object of religious worſhip.

ABÆ, or Aba (anc. geog.) a town of Phocis in Greece, near Helicon; famous for an oracle of Apollo older than that at Delphi, and for a rich temple plundered and burnt by the Perſians.

ABAFT, a ſea-term, ſignifying the hinder part of a ſhip, or all thoſe parts both within and without which lie towards the ſtern, in oppoſition to afore; which ſee. *Abaft*, is alſo uſed as a prepoſition, and ſignifies *further aft*, or *nearer the ſtern;* as the barricade ſtands *abaft* the main-maſt, *i. e.* behind it, or nearer the ſtern.

ABAISSED, *Abaiſſe*, in heraldry, an epithet applied to the wings of eagles, &c. when the tip looks downwards to the point of the ſhield, or when the wings are ſhut, the natural way of bearing them being extended.

ABAKA khan, the 18th emperor of the Moguls, a wiſe and clement prince. He reigned 17 years, and is by ſome authors ſaid to have been a Chriſtian. It may be admitted, indeed, that he joined with the Chriſtians in keeping the feaſt of Eaſter, in the city Hanadan, ſome ſhort time before his death. But this is no proof of his Chriſtianity; it being common, in times of brotherly love, for Chriſtians and Mahometans to join in keeping the ſame feaſts, when each would compliment the other with doing honour to his ſolemnity.

ABALAK, a town of Siberia, two miles from Tobolſk. E. Long. 64. 10. N. Lat. 57. 1.

ABALIENATION, in law, the act of transferring one man's property to another.

ABALLABA, the ancient name of Appleby, a town in Weſtmoreland, remarkable only for its antiquity, having been a Roman ſtation. W. Long. 1. 4. N. Lat. 55. 38.

ABALUS (anc. geog.), ſuppoſed by the ancients to be an iſland in the German ocean, called by Timæus *Baſilia*, and by Xenophon Lampſacenus *Baltia;* now the peninſula of Scandinavia. Here, according to Pliny, ſome imagined that amber dropped from the trees.

ABANA, or Amana (anc. geog.), a river of Phœnicia, which, riſing from Mount Hermon, waſhed the ſouth and weſt ſides of Damaſcus, and falls into the Phœnician ſea to the north of Tripolis, called *Chryſorrheas* by the Greeks.

ABANGA. See Ady.

ABANO, a town of the Paduano, in the republic of Venice, famous among the ancients for its hot baths.

ABANTES, a people who came originally from Thrace, and ſettled in Phoceca, a country of Greece, where they built a town which they called Aba, after the name of Abas their leader; and, if we may credit ſome ancient authors, the Abantes went afterwards into the iſland Eubœa, now called Negropont: others ſay the Abantes of Eubœa came from Athens. The Abantes were a very warlike people, cloſing with their enemies, and fighting hand to hand.

ABANTIAS, or Abantis (anc. geog.), a name of the iſland Eubœa in the Egean ſea, extending along the coaſt of Greece, from the promontory Sunium of Attica to Theſſaly, and ſeparated from Bœotia by a narrow ſtrait called *Euripus*. From its length the iſland was formerly called *Macris*; afterwards *Abantias*, or *Abantis*, from the Abantes, a people originally of Thrace, called by Homer οπισθεν Κομοωντες, from wearing their hair long behind, having in a battle experienced the inconvenience of wearing long hair before. From cutting their hair before, they were called *Curetes*.

ABAPTISTON, in ſurgery, the perforating part of the inſtrument called a trepan.

ABARA, a town in the Greater Armenia, under the dominion of the Turks: it is often the reſidence of the archbiſhop of Nakſivan. Long. 46. 25. Lat. 39. 45.

ABARANER, a town of Aſia, in Grand Armenia, belonging to the Turks: it is ſeated on the river Alingena. Long. 46. 30. Lat. 39. 50.

ABARCA, an ancient kind of ſhoe uſed in Spain for paſſing the mountains with. It was made of raw hides, and bound with cords, which ſecured the feet of travellers againſt the ſnow.

ABARIM, high mountains of ſteep aſcent, ſeparating the country of the Ammonites and Moabites from the land of Canaan, where Moſes died. According to Joſephus, they ſtood oppoſite to the territory of Jericho, and were the laſt ſtation but one of the Iſraelites coming from Egypt. Nebah and Piſgah were parts of theſe mountains.

ABARIS, the Hyperborean; a celebrated ſage of antiquity, whoſe hiſtory and travels have been the ſubject of much learned diſcuſſion. Such a number of fabulous ſtories * were told of him, that Herodotus himſelf ſeems to ſcruple to relate them. He tells us only, † that this Barbarian was ſaid to have travelled with an arrow, and to have taken no ſuſtenance: but this does not acquaint us with the marvellous properties which were attributed to that arrow; nor that it had been given him by the Hyperborean Apollo. With regard to the occaſion of his leaving his native country, Harpocration ‡ tells us, that the whole earth being infeſted with a deadly plague, Apollo, upon being conſulted, gave no other anſwer, than that the Athenians ſhould offer up prayers in behalf of all other nations: upon which, ſeveral countries deputed ambaſſadors to Athens, among whom was Abaris the Hyperborean. In this journey he renewed the alliance between his countrymen and the inhabitants of the iſland of Delos. It appears that he alſo went to Lacedæmon; ſince, according to ſome writers §, he there built a temple conſecrated to Proſerpine the Salutary. It is aſſerted, that he was capable of foretelling earthquakes, driving away plagues, laying ſtorms ‡, &c. He wrote ſeveral books, as Suidas † informs us, *viz.* Apollo's arrival into the country of the Hyperboreans; The nuptials of the river Hebrus; Θεογονια, or the Generation of the Gods; A collection of oracles; &c. Himerius the ſophiſt applauds him for ſpeaking pure Greek; which attainment will be no matter of wonder to ſuch as conſider the ancient intercourſe there was between the Greeks and Hyperboreans. If the Hebrides, or Weſtern Iſlands of Scotland (ſays Mr. Toland *), were the Hyperboreans of Diodorus, † then the celebrated Abaris was of that country; and likewiſe a druid, having been the prieſt of Apollo. Suidas, who knew not the diſtinction of the inſular Hyperboreans, makes him a Scythian; as do ſome others, miſled by the ſame vulgar error; though Diodorus has truly fixed his country in an iſland, and not on the continent. Indeed, the fictions and miſtakes concerning our Abaris are infinite: however, it is by all agreed that he travelled quite over Greece, and from thence into Italy, where he converſed familiarly with Pythagoras, who favoured him beyond all his diſciples, by inſtructing him in his doctrines (eſpecially his thoughts of nature), in a plainer and more compendious method than he did any other. This diſtinction could not but be very advantageous to Abaris. The Hyperborean, in return, preſented the Samian, as though he equalled Apollo himſelf in wiſdom, with the ſacred arrow, on which the Greeks have fabulouſly related ‡ that he ſat aſtride, and flew upon it, through the air, over rivers and lakes, foreſts and mountains; in like manner as our vulgar ſtill believe, particularly thoſe of the Hebrides, that wizards and witches fly whitherſoever they pleaſe on their broom ſticks. The orator Himerius above mentioned, though one of thoſe who, from the equivocal ſenſe of the word Hyperborean, ſeem to have miſtaken Abaris for a Scythian, yet deſcribes his perſon accurately, and gives him a very noble character. "They relate (ſays he) "that Abaris the ſage was by nation an Hyperborean, "appeared a Grecian in ſpeech, and reſembled a Scy"thian in his habit and appearance. He came to "Athens, holding a bow in his hand, having a quiver "hanging on his ſhoulders, his body wrapt up in a "plaid, girt about the loins with a gilded belt, and "wearing trowſers reaching from his waiſt downward." By this it is evident (continues Mr. Toland) that he was not habited like the Scythians, who were always covered with ſkins; but appeared in the native garb of an aboriginal Scot. As to what relates to his abilities, Himerius informs us, that "he was affable and "pleaſant in converſation, in diſpatching great affairs "ſecret and induſtrious, quick-ſighted in preſent exi"gencies, in preventing future dangers circumſpect, "a ſearcher after wiſdom, deſirous of friendſhip, truſt"ing little to fortune, and having every thing truſted "to him for his prudence." Neither the Academy nor the Lycæum could have furniſhed a man with fitter qualities to travel ſo far abroad, and to ſuch wiſe

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* Jamblich. *Vita Pythag.*

† Lib. iv. cap. 36.

‡ Under the word 'Αϐαρις.

§ Pauſanias lib. iii. p. 94.

‡ Porphyry in *Vita Pythagor.*

† Under the word 'Αϐαρις.

* Account of the Druids, in his *Poſthumous Works*, vol. i. p. 161.

† Diod. Sic. lib. ii, iii.

‡ Jamblichi *Vita Pytha.* p. 128.

nations, about affairs no leſs arduous than important. And if we further attentively conſider his moderation in eating, drinking, and the uſe of all thoſe things which our natural appetites inceſſantly crave; joining the candour and ſimplicity of his manners with the ſolidity and wiſdom of his anſwers, all which we find ſufficiently atteſted: it muſt be owned, that the world at that time had few to compare with Abaris.

ABARTICULATION, in anatomy, a ſpecies of articulation admitting of a manifeſt motion; called alſo Diarthroſis, and Dearticulatio, to diſtinguiſh it from that ſort of articulation which admits of a very obſcure motion, and is called Synarthroſis.

ABAS, a weight uſed in Perſia for weighing pearls. It is 1-8th leſs than the European carat.

Abas, in the heathen mythology, was the ſon of Hypothoon and Meganira, who entertained Ceres, and offered a ſacrifice to that goddeſs; but Abas ridiculing the ceremony, and giving her opprobrious language, ſhe ſprinkled him with a certain mixture ſhe held in her cup, on which he became a newt or water-lizard.

Abas (Schah) the Great, was third ſon of Codabendi, 7th king of Perſia, of the race of the Sophis. Succeeding to his father at 18, in 1585, he found the affairs of Perſia at a low ebb, occaſioned by the conqueſts of the Turks and Tartars. He regained ſeveral of the provinces they had ſeized; but death put a ſtop to his victories in 1629, after a reign of 44 years. He was the greateſt prince that had reigned in Perſia for many ages; and it was he who made Iſpahan the metropolis of Perſia: his memory is held in the higheſt veneration among the Perſians.

Abas (Schah) his grandſon, 9th king of Perſia, of the race of the Sophis, ſucceeded his father Seſi at 13 years of age: he was but 18 when he made himſelf maſter of the city Candahar, which had ſurrendered in his father's reign to the Great Mogul, and all the province about it; and he preſerved it afterwards againſt this Indian emperor, though he beſieged it more than once with an army of 300,000 men. He was a very merciful prince, and openly protected the Chriſtians: he had formed a deſign of extending the limits of his kingdom toward the north, and had for that effect levied a powerful army; but death put a ſtop to all his great deſigns at 37 years of age, in 1666.

ABASCIA, or Abcas, a country in Aſia, tributary to the Turks, ſituated on the coaſt of the Black Sea. The people are poor, thieviſh, and treacherous, inſomuch that there is no trading with them without the utmoſt caution. Their commodities are furs, buck and tyger ſkins, linen yarn, boxwood, and bees-wax: but their greateſt traffic is in ſelling their own children, and even one another, to the Turks; inſomuch that they live in perpetual diſtruſt. They are deſtitute of many neceſſaries of life, and have nothing among them that can be called a town; though we find Anacopia, Dundar, and Czekorni, mentioned in the maps. They have the name of Chriſtians; but have nothing left but the name, any more than the Mingrelians their northern neighbours. The men are robuſt and active, and the women are fair and beautiful; on which account the Turks have a great value for the female ſlaves which they purchaſe from among them. Their cuſtoms are much the ſame as thoſe of the Mingrelians: which ſee. E. Long. from 39 to 43. Lat. from 43 to 45.

ABASCUS, a river of Aſiatic Sarmatia, which, riſing from Mount Caucaſus, falls into the Euxine, between Pityus to the eaſt, and Noſis to the weſt.

ABASITIS (anc. geog.), a tract of Aſiatic Myſia, in which was ſituated the city of Ancyra.

ABASSI, or Abassis, a ſilver coin current in Perſia, equivalent in value to a French livre, or tenpence halfpenny Sterling. It took its name from Schah Abbas II. king of Perſia, under whom it was ſtruck.

ABASSUS (anc. geog.), a town of the Greater Phrygia, on the confines of the Toliſtobagii, a people of Galatia in Aſia.

ABATAMENTUM, in law, is an entry to lands by interpoſition, *i. e.* when a perſon dies ſeized, and another who has no right enters before the heir.

To ABATE, (from the French *abbatre*, to pull down, overthrow, demoliſh, batter down, or deſtroy), a term uſed by the writers of the Engliſh common-law, both in an active and neutral ſenſe; as, To abate a caſtle, is to beat it down. To abate a writ, is, by ſome exception, to defeat or overthrow it. A ſtranger abateth; that is, entereth upon a houſe or land void by the death of him that laſt poſſeſſed it, before the heir takes poſſeſſion, and ſo keepeth him out: wherefore, as he that putteth out him in poſſeſſion is ſaid to diſſeize, ſo he that ſteppeth in between the former poſſeſſor and his heir is ſaid to abate. In the neuter ſignification thus: The writ of the demandant ſhall abate; that is, ſhall be diſabled, fruſtrated or overthrown. The appeal abateth by covin; that is, the accuſation is defeated by deceit.

Abate, in the manege, implies the performing any downward motion properly. Thus a horſe is ſaid to abate to take down his curvets, when he puts both his hind legs to the ground at once, and obſerves the ſame exactneſs in all the times.

ABATELEMENT, in commerce, a term uſed for a prohibition of trade to all French merchants in the ports of the Levant who will not ſtand to their bargains, or refuſe to pay their debts. It is a ſentence of the French conſul, which muſt be taken off before they can ſue any perſon for the payment of their debts.

ABATEMENT, in heraldry, an accidental figure ſuppoſed to have been added to coats of arms, in order to denote ſome diſhonourable demeanour or ſtain, whereby the dignity of coat-armour was rendered of leſs eſteem. See Heraldry.

Abatement, in law. See *To* Abate.

Abatement, in the cuſtoms, an allowance made upon the duty of goods, when the quantum damaged is determined by the judgment of two merchants upon oath, and aſcertained by a certificate from the ſurveyor and land-waiter.

ABATIS, an ancient term for an officer of the ſtables.

ABATON, an erection at Rhodes, as a fence to the trophy of Artemiſia, queen of Halicarnaſſus, Coos, &c. raiſed in memory of her victory over the Rhodians; or rather as a ſcreen to conceal the diſgrace of the Rhodians from the eyes of the world, the effacing or deſtroying the trophy being with them a point of religion.

ABATOR, in law, a term applied to a perſon who enters to a houſe or lands void by the death of the laſt poſſeſſor, before the true heir.

ABATOS (anc. geog.), an iſland in the lake Moeris, formerly famous for its papyrus. It was the burial-place of Oſiris.

ABAVO, in botany, a ſynonime of the ADANSONIA.

ABB, a term, among clothiers, applied to the yarn of a weaver's warp. They ſay alſo *Abb-wool* in the ſame ſenſe.

ABBA (anc. geog.) a town of Afric Propria, near Carthage.

ABBA, in the Syriac and Chaldee languages, literally ſignifies *a father;* and, figuratively, a ſuperior, reputed as a father in reſpect of age, dignity, or affection. It is more particularly uſed in the Syriac, Coptic, and Ethiopic churches, as a title given to the biſhops. The biſhops themſelves beſtow the title *Abba* more eminently on the biſhop of Alexandria; which occaſioned the people to give him the title of *Baba,* or *Papa,* that is, *Grandfather;* a title which he bore before the biſhop of Rome. It is a Jewiſh title of honour given to certain rabbins called *Tanaites;* and it is alſo particularly uſed, by ſome writers of the middle age, for the ſuperior of a monaſtery, uſually called ABBOT.

ABBADIE (James), an eminent Proteſtant divine, born at Nay in Bern in 1654; firſt educated there under the famous John la Placette, and afterward at the univerſity of Sedan. From thence he went into Holland and Germany, and was miniſter in the French church of Berlin. He left that place in 1690; came into England; was ſometime miniſter in the French church in the Savoy, London; and was made dean of Killalow in Ireland. He died at St Mary le Bonne near London, in 1727, aged 73. He was ſtrongly attached to the cauſe of king William, as appears in his elaborate defence of the revolution, and his hiſtory of the aſſaſſination-plot. He had great natural abilities, which he improved by true and uſeful learning. He was a moſt zealous defender of the primitive doctrine of the Proteſtants, as appears by his writings; and that ſtrong nervous eloquence, for which he was ſo remarkable, enabled him to enforce the doctrines of his profeſſion from the pulpit with great ſpirit and energy. He publiſhed ſeveral works in French that were much eſteemed; the principal of which are, A Treatiſe on the Truth of the Chriſtian Religion; The art of Knowing one's Self; A Defence of the Britiſh Nation; The Deity of Jeſus Chriſt eſſential to the Chriſtian Religion; The Hiſtory of the laſt conſpiracy in England, written by order of king William III.; and The Triumph of Providence and Religion, or the opening the Seven Seals by the Son of God.

ABBAS, ſon of Abdalmothleb, and Mahomet's uncle, oppoſed his nephew with all his power, eſteeming him an impoſtor and infidel; but in the ſecond year of the Hegira, being overcome and made a priſoner at the battle of Bendir in 623, a great ranſom being demanded for him, he repreſented to Mahomet, that his paying it would reduce him to poverty, which would redound to the diſhonour of the family. But Mahomet having been informed of Abbas's having ſecreted large ſums of money, aſked him after the purſes of gold he had left in his mother's cuſtody at Mecca. Abbas, upon this, conceiving him to be really a prophet, embraced his new religion; became one of his principal captains; and ſaved his life when in eminent danger at the battle of Henain, againſt the Thakeſites, ſoon after the reduction of Mecca. But beſides being a great commander, Abbas was a famous doctor of the Muſſulman law, inſomuch that he read lectures upon every chapter of the Koran, as his nephew pretended to receive them one by one from heaven. He died in 652, and his memory is held in the higheſt veneration among the Muſſulmans to this day.

Abul ABBAS ſurnamed *Saſſah,* was proclaimed khalif; and in him began the Dynaſty of the

ABBASSIDES, who poſſeſſed the khalifate for 524 years; and there were 37 khalifs of this race who ſucceeded one another without interruption.

ABBE, in a monaſtic ſenſe, the ſame with ABBOT.

ABBE, in a modern ſenſe, is the name of a curious popular character in France, very much mentioned, but very little known, in Britain. The term is not to be rendered in our language, as the exiſtence of the being which it denominates is poſterior to the reformation, and no ſuch character was known among the Romaniſts till about a century and a half ago.

Abbés, according to the ſtricteſt definition, are perſons who have not yet obtained any preciſe or fixed ſettlement in church or ſtate, but moſt heartily wiſh for and would accept of, either, juſt as it may happen. In the mean while, their privileges are many. They are admiſſible in all companies, and no degradation to the beſt, notwithſtanding they are ſometimes found in the worſt. Their dreſs is rather that of an academic, or of a profeſſed ſcholar, than of an eccleſiaſtic; and, never varying in colour, is no incumbrance on the pocket.

Theſe abbés are very numerous, and no leſs uſeful. They are, in colleges, the inſtructors of youth; in private families, the tutors of young gentlemen; and many procure a decent livelihood by their literary and witty compoſitions of all kinds, from the profoundeſt philoſophy to the moſt airy romances. They are, in ſhort, a body of men who poſſeſs a fund of univerſal talents and learning, and are inceſſantly employed in the cultivation of every various branch of literature and ingenuity. No ſubject whatever eſcapes them; ſerious or gay, ſolid or ludicrous, ſacred or profane, all pay tribute to their reſearches; and as they are converſant in the loweſt as well as the higheſt topics, their fame is equally great in the learned and in the ſcribbling world.

A diſtinguiſhing part of their character, too, though we ſhall but ſlightly touch it, is their devotion to the fair-ſex: whoſe favourites, in return, they have the honour of being in the moſt enviable degree; the wit and ſmartneſs for which they are uſually remarkable, being juſt the very thing that ſuit the French ladies.—In fine, theſe abbés are ſought after by moſt people, on various accounts; as they are equally men of buſineſs and pleaſure, not leſs expert in the moſt ſerious tranſactions, than fond of enjoying their ſhare in whatever occupies the gay world. Hence they diligently frequent all public ſpectacles, which are thought incomplete without them; as they compoſe the moſt intelligent part of the company, and are the moſt weighty approvers or condemners of what paſſes in almoſt all places.

ABBESS, the ſuperior of an abbey or convent of nuns. The abbeſs has the ſame rights and authority over her nuns that the abbots regular have over their monks. The ſex indeed does not allow her to perform the ſpiritual functions annexed to the prieſthood, wherewith the abbot is uſually inveſted; but there are inſtances of ſome abbeſſes who have a right or rather a privilege, to commiſſion a prieſt to act for them. They have even a kind of epiſcopal juriſdiction, as well as ſome abbots who are exempted from the viſitation of their dioceſans.

Martene, in his treatiſe on the rights of the Church, obſerves, that ſome abbeſſes have formerly confeſſed their nuns. But he adds, that their exceſſive curioſity carried them ſuch lengths, that there aroſe a neceſſity of checking it. However, St Baſil, in his Rule, allows the abbeſs to be preſent with the prieſt at the confeſſion of her nuns.

ABBEVILLE, a conſiderable city of France in Picardy, and the capital of Ponthieu; the river Somme runs through the middle of it, and divides it into two parts. It has a collegiate church and twelve pariſh-churches; the moſt conſiderable of which are St George's and St Giles's, beſides a great number of monaſteries and nunneries, a bailiwic, and a preſidial court. It is a fortified town; the walls are flanked with baſtions, and ſurrounded by large ditches; and was never yet taken; from which circumſtance it is ſometimes called the *Maiden Town*. The country about it is low, marſhy, and dirty. It is pretty well peopled, and is famous for its woollen manufactory. The cloths and ſtuffs made there are ſaid to be now little inferior to thoſe of England and Holland. The work, however, is aſſiſted by the clandeſtine importation of Engliſh and Iriſh wool, and workmen from Great Britain. It is about fifteen miles eaſt of the Britiſh channel, and ſhips may come from thence by the river Somme to the middle of the town. E. Long. 2. 6. Lat. 50. 7.

ABBEY, a monaſtery, or religious houſe, governed by a ſuperior under the title of *abbot* or *abbeſs*.

Abbeys differ from *priories*, in that the former are under the direction of an abbot, and the others of a prior: but abbot and prior (we mean a prior conventual) are much the ſame thing, differing in little but the name.

Fauchet obſerves, that, in the early days of the French monarchy, dukes and counts were called *abbots*, and duchies and counties *abbeys*. Even ſome of their kings are mentioned in hiſtory under the title of *abbots*. Philip I. Louis VI. and afterwards the dukes of Orleans, are called *abbots of the monaſtery of St Aignan*. The dukes of Aquitain were called *abbots of the monaſtery of St Hilary, at Poictiers*; and the earls of Anjou, of *St Aubin*, &c.

Monaſteries were at firſt nothing more than religious houſes, whither perſons retired from the buſtle of the world to ſpend their time in ſolitude and devotion. But they ſoon degenerated from their original inſtitution, and procured large privileges, exemptions, and riches. They prevailed greatly in Britain before the reformation; particularly in England: and as they increaſed in riches, ſo the ſtate became poor; for the lands, which theſe regulars poſſeſſed were *in mortua manu*, i. e. could never revert to the lords who gave them. This inconvenience gave riſe to the ſtatutes againſt gifts in *mortmaine*, which prohibited donations to theſe religious houſes: and Lord Coke tells us, that ſeveral lords, at their creation, had a clauſe in their grant, that the donor might give or ſell his land to whom he would (*exceptis viris religioſis & Judæis*) excepting monks and Jews.

Theſe places where wholly aboliſhed in England at the time of the Reformation; Henry VIII. having firſt appointed viſitors to inſpect into the lives of the monks and nuns, which were found in ſome places very diſorderly: upon which, the abbots, perceiving their diſſolution unavoidable, were induced to reſign their houſes to the king, who by that means became inveſted with the abbey-lands: theſe were afterwards granted to different perſons, whoſe deſcendents enjoy them at this day: they were then valued at 2,853,000*l*. per annum, an immenſe ſum in thoſe days.

Though the ſuppreſſion of religious houſes, even conſidered in a political light only, was of a very great national benefit, it muſt be owned, that, at the time they flouriſhed, they were not entirely uſeleſs. Abbeys or monaſteries were then the repoſitories, as well as the ſeminaries, of learning; many valuable books and national records, as well as private evidences, have been preſerved in their libraries; the only places wherein they could have been ſafely lodged in thoſe turbulent times. Many of thoſe, which had eſcaped the ravages of the Danes, were deſtroyed with more than Gothic barbarity at the diſſolution of the abbeys. Theſe ravages are pathetically lamented by John Bale, in his Declaration upon Leland's Journal 1549. "Covetouſneſs," ſays he, "was at that time ſo buſy about private commodity, that public wealth, in that moſt neceſſary and of reſpect, was not any where regarded. A number of them which purchaſed theſe ſuperſtitious manſions, reſerved of the library-books, ſome to ſerve their jacks, ſome to ſcour the candleſticks, and ſome to rub their boots; ſome they ſold to the grocer and ſoap-ſeller; and ſome they ſent over ſea to the book-binders, not in ſmall numbers, but in whole ſhips full; yea, the univerſities of this realm are not clear of ſo deteſtable a fact. I know a merchant that bought the contents of two noble libraries for 40s. price; a ſhame it is to be ſpoken! This ſtuff hath he occupied inſtead of gray paper, by the ſpace of more than theſe ten years, and yet he hath ſtore enough for as many years to come. I ſhall judge this to be true, and utter it with heavineſs, that neither the Britons under the Romans and Saxons, nor yet the Engliſh people under the Danes and Normans, had ever ſuch damage of their learned monuments as we have ſeen in our time."

In theſe days every abbey had at leaſt one perſon whoſe office it was to inſtruct youth; and the hiſtorians of this country are chiefly beholden to the monks for the knowledge they have of former national events. In theſe houſes alſo the arts of painting, architecture, and printing, were cultivated. The religious houſes alſo were hoſpitals for the ſick and poor; affording likewiſe entertainment to travellers at a time when there were no inns. In them the nobility and gentry who were heirs to their founders could provide for a certain number of ancient and faithful ſervants, by procuring them corodies, or ſtated allowances of meal, drink, and clothes. They were likewiſe an aſylum for aged and indigent perſons of good family. The neighbouring places were alſo greatly benefited by the fairs procured for them, and by their exemption from foreſt-laws; add to which, that the monaſtic eſtates were generally let at very eaſy rents, the fines given at renewals included.

ABBEYBOYLE, a town of Ireland, in the county of Roſcommon, and province of Connaught. W. Long. 8. 32. Lat. 56. 54. It is remarkable for an old abbey.

ABBEYHOLM, a town in Cumberland, ſo called from an abbey built there by David king of Scots. It ſtands on an arm of the ſea. W. Long. 2. 38. Lat. 54. 45.

ABBOT, or ABBAT, the ſuperior of a monaſtery of monks erected into an abbey or prelacy.

The name *Abbot* is originally Hebrew, where it ſignifies father. The Jews call *father*, in their language, *Ab;* whence the Chaldeans and Syrians formed *Abba;* thence the Greeks Αϐϐας, which the Latins retained, *Abbas;* and hence our *Abbot*, the French *Abbé*, &c. —St. Mark and St. Paul uſe the Syriac *Abba* in their Greek, by reaſon it was then commonly known in the ſynagogues and the primitive aſſemblies of the Chriſtians; adding to it, by way of interpretation, the word *father*, Αϐϐα ο πατηρ, "Abba, father;" *q. d.* Abba, that is to ſay, Father.—But the name Ab, or Abba, which at firſt was a term of tenderneſs and affection in the Hebrew and Chaldee, became at length a title of dignity and honour: The Jewiſh doctors affected it; and one of their moſt ancient books, containing the ſayings or apophthegms of divers of them, is entitled Pirke *Abboth*, or Avoth; *i. e.* Chapters of the Fathers. It was in alluſion to this affectation, that Jeſus Chriſt forbad his diſciples to call any man their father on earth; which word St. Jerome turns againſt the ſuperiors of the monaſteries of his time, for aſſuming the title of *Abbots*, or Fathers.

The name *Abbot*, then, appears as old as the inſtitution of monks itſelf.—The governors of the primitive monaſteries aſſumed indifferently the titles *Abbots*, and *Archimandrites*.* They were really diſtinguiſhed from the clergy; though frequently confounded with them, becauſe a degree above laymen.

In thoſe early days, the abbots were ſubject to the biſhops and the ordinary paſtors. Their monaſteries being remote from cities, built in the fartheſt ſolitudes, they had no ſhare in eccleſiaſtical affairs. They went on Sundays to the pariſh-church with the reſt of the people; or, if they were too remote, a prieſt was ſent them to adminiſter the ſacraments; till at length they were allowed to have prieſts of their own body. The abbot or archimandrite himſelf was uſually the prieſt: but his function extended no farther than to the ſpiritual aſſiſtance of his monaſtery; and he remained ſtill in obedience to the biſhop. There being among the abbots ſeveral perſons of learning, they made a vigorous oppoſition to the riſing hereſies of thoſe times; which firſt occaſioned the biſhops to call them out of their deſarts, and fix them about the ſuburbs of cities, and at length in the cities themſelves: from which æra their degeneracy is to be dated. The abbots, now, ſoon wore off their former plainneſs and ſimplicity, and began to be looked on as a ſort of little prelates. They aſpired at being independent of the biſhops; and became ſo inſupportable, that ſome ſevere laws were made againſt them at the council of Chalcedon; this notwithſtanding, in time many of them carried the point of independency, and got the appellation of *lord*, with other badges of the epiſcopate, particularly the mitre.

Hence aroſe new ſpecies of diſtinctions between the abbots. Thoſe were termed *mitred* abbots, who were privileged to wear the mitre, and exerciſe epiſcopal authority within their reſpective precincts, being exempted from the juriſdiction of the biſhop. Others were called *croſiered* abbots, from their bearing the croſier or paſtoral ſtaff. Others were ſtyled *œcumenical* or univerſal abbots, in imitation of the patriarch of Conſtantinople: while others were termed *cardinal* abbots, from their ſuperiority over all other abbots.—In Britain, the mitred abbots were lords of parliament; and called abbots-ſovereign, and abbots-general, to diſtinguiſh them from the other abbots. And as there were lords abbots, ſo there were alſo lords priors, who had exempt juriſdiction, and were likewiſe lords of Parliament. Some reckon 26 of theſe lords abbots and priors that ſat in parliament. Sir Edward Coke ſays, that there were 27 parliamentary abbots and two priors. In the parliament 20 Rich. II. there were but 25 abbots and two priors: but in the ſummons to parliament *anno* 4 Ed. III. more are named.

At preſent, in the Roman-catholic countries, the principal diſtinctions obſerved between abbots are thoſe of *regular* and *commendatory*. The former take the vow and wear the habit of their order; whereas the latter are ſeculars, though they are obliged by their bulls to take orders when of proper age.

Anciently the ceremony of creating an abbot conſiſted in clothing him with the habit called *cucullus*, or cowl; putting the paſtoral ſtaff into his hand, and the ſhoes called *pedales* on his feet; but, at preſent, it is only a ſimple benediction, improperly called, by ſome, conſecration.

ABBOT is alſo a title given to others beſide the ſuperiors of monaſteries: thus biſhops, whoſe ſees were formerly abbeys, are called abbots; as are the ſuperiors of ſome congregations of regular canons, particularly that of St. Geneviéve at Paris: and among the Genoeſe, the chief magiſtrate of their republic formerly bore the title of Abbot of the people. It was likewiſe uſual, about the time of Charlemagne, for ſeveral lords to aſſume the title of *count-abbots, abba comites;* and that for no other reaſon, but becauſe the ſuperintendancy of certain abbeys was committed to them.

ABBOT (George), archbiſhop of Canterbury, was born Oct. 29. 1562, at Guildford in Surrey. He went through his ſtudies at Oxford, and in 1597 was choſen principal of Univerſity College. In 1599, he was inſtalled dean of Wincheſter: the year following he was choſen vice-chancellor of the univerſity of Oxford, and a ſecond time in 1603. In 1604, that tranſlation of the bible now in uſe was begun by the direction of king James; and Dr Abbot was the ſecond of eight divines of Oxford, to whom the care of tranſlating the whole New Teſtament (excepting the epiſtles) was committed. The year following, he was a third time vice-chancellor. In 1608, he went to Scotland with George Hume Earl of Dunbar, to aſſiſt in eſtabliſhing an union betwixt the kirk of Scotland and the church of England; and in this affair he behaved* with ſo much addreſs and moderation, that it laid the foundation of all his future preferment. For king James ever after paid great deference to his advice and counſel; and upon the death of Dr. Overton biſhop of Litchfield and Coventry, he named Dr. Abbot for his ſucceſſor, who was accordingly conſtituted biſhop of thoſe two united ſees in December 1609. About a month afterwards he was tranſlated to the ſee of London, and on the ſecond of November thereafter was raiſed to the archiepiſcopal ſee.

* See *Monk* and *Archimandrite*.

* Heylin's hiſt. of Preſbyterians, p. 83.

It is not however improbable, that his extravagant adulation of his royal maſter, in which he went as far as any other court-chaplain could do, contributed not a little to the acceleration of his preferment. In the preface to a pamphlet he publiſhed, the following ſpecimen of ridiculous flattery occurs: Speaking of the king, he ſays, "whoſe life hath been ſo immaculate and unſpotted, &c. that even malice itſelf, which leaves nothing unſearched, could never find true blemiſh in it, nor caſt probable aſperſion on it.—Zealous as David; learned and wiſe, the *Solomon* of our age; religious as Joſias; careful of ſpreading Chriſt's faith as Conſtantine the Great; juſt as Moſes; undefiled in all his ways as a Jehoſaphat and Hezekias; full of clemency as another Theodoſius."—If Mr. Walpole had ſeen this paſſage, he certainly would not have ſaid, that "honeſt Abbot could not flatter."

His great zeal for the Proteſtant religion made him a ſtrenuous promoter of the match between the Elector Palatine and the Princeſs Elizabeth; which was accordingly concluded and ſolemnized the 14th of February 1612, the archbiſhop performing the ceremony on a ſtage erected in the royal chapel. In the following year happened the famous caſe of divorce betwixt the lady Frances Howard, daughter of the earl of Suffolk, and Robert earl of Eſſex: an affair which has been by many conſidered as one of the greateſt blemiſhes in king James's reign; but the part acted therein by the archbiſhop added much to the reputation he had already acquired for incorruptible integrity. The matter was by the king referred to a court of delegates. The archbiſhop ſaw plainly, that his majeſty was very deſirous the lady ſhould be divorced; but he was, in his own judgment, directly againſt the divorce. He laboured all he could to extricate himſelf from this difficulty, by having an end put to the cauſe by ſome other way than by ſentence: but it was to no purpoſe; for thoſe who drove on this affair, had got too great power to be reſtrained from bringing it to the concluſion the king deſired. The archbiſhop prepared a ſpeech, which he intended to have ſpoken againſt the nullity of the marriage, in the court at Lambeth; but he did not make uſe of it, becauſe the king ordered the opinions to be given in few words. He continued, however, inflexible in his opinion againſt the divorce; and drew up his reaſons, which the king thought fit to anſwer himſelf. It need ſcarce be added, that ſentence was given in the lady's favour. In 1611, the king publiſhed a declaration, which he ordered to be read in all churches, permitting ſports and paſtimes on the Lord's day: this gave great uneaſineſs to the archbiſhop; who, happening to be at Croydon when it came thither, had the courage to forbid its being read.

Being now in a declining ſtate of health, the archbiſhop uſed in the ſummer to go to Hampſhire, for the ſake of recreation; and being invited by lord Zouch to hunt in his park at Bramzill, he met there with the greateſt misfortune that ever befel him; for he accidentally killed the game-keeper by an arrow from a croſs-bow which he ſhot at one of the deer. This accident threw him into a deep melancholy; and he ever afterwards kept a monthly faſt on Tueſday, the day on which this fatal miſchance happened, and he ſettled an annuity of 20*l.* on the widow.* There were ſeveral perſons who took an advantage of this misfortune, to leſſen him in the king's favour; but his majeſty ſaid, "An angel might have miſcarried in this ſort." His enemies alleging that he had incurred an irregularity, and was thereby incapacitated for performing the offices of a primate; the king directed a commiſſion to ten perſons to enquire into this matter.

The reſult, however, was not ſatisfactory to his Grace's enemies; it being declared, that, as the murder was involuntary, he had not forfeited his archiepiſcopal character. The archbiſhop thenceforward ſeldom aſſiſted at the council, being chiefly hindered by his infirmities; but in the king's laſt illneſs he was ſent for, and attended with great conſtancy till his Majeſty expired on the 27th of March, 1625. He performed the ceremony of the coronation of king Charles I. though very infirm and much troubled with the gout. He was never greatly in this king's favour; and the duke of Buckingham being his declared enemy, watched an opportunity of making him feel the weight of his diſpleaſure. This he at laſt accompliſhed, upon the archbiſhop's refuſing to licenſe a ſermon, preached by Dr. Sibthorpe to juſtify a loan which the king had demanded, and pregnant with principles which tended to overthrow the conſtitution. The archbiſhop was immediately after ſuſpended from all his functions as primate; and they were exerciſed by certain biſhops commiſſioned by the king, of whom Laud, the archbiſhop's enemy, and afterwards his ſucceſſor, was one: while the only cauſe aſſigned for this procedure was, That the archbiſhop could not at that time perſonally attend thoſe ſervices which were otherwiſe proper for his cogniſance and direction. He did not, however, remain long in this ſituation; for a parliament being abſolutely neceſſary, his Grace was ſent for, and reſtored to his authority and juriſdiction. But not proving friendly to certain rigorous meaſures adopted by the prevailing church-party, headed by Laud, whoſe power and intereſt at court were now very conſiderable, his preſence became unwelcome there; ſo that upon the birth of the Prince of Wales, afterwards Charles II. Laud had the honour to baptize him, as dean of the chapel. The archbiſhop being worn out with cares and infirmities, died at Croydon, the fifth of Auguſt 1633, aged 71 years; and was buried at Guildford, the place of his nativity, and where he had endowed an hoſpital with lands to the amount of 300*l.* per annum. A ſtately monument was erected over the grave, with the effigy of the archbiſhop in his robes.

He ſhewed himſelf, in moſt circumſtances of his life, a man of great moderation to all parties; and was deſirous that the clergy ſhould attract the eſteem of the laity by the ſanctity of their manners, rather than claim it as due to their function. His notions and principles, however, not ſuiting the humour of ſome writers, have drawn upon him many ſevere reflections; particularly, which is to be regretted, from the earl of Clarendon. But Dr. Welwood has done more juſtice to his merit and abilities.* He wrote ſeveral tracts upon various ſubjects; and, as already mentioned, tranſlated part of the New Teſtament, with the reſt of the Oxford divines, 1611.

It is proper to obſerve here, that there was another writer of both his names, who flouriſhed ſomewhat later. This George Abbot wrote *A paraphraſe on Job*,

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* Fuller's church hiſt. cent. xviii. p. 87.

* Memoirs, 8vo. 1700. p. 38.

Job, *A vindication of the ſabbath*, and *A paraphraſe on the Pſalms*.

ABBOT (Robert), elder brother to the former, and born at Guildford in 1560, went through his ſtudies in Baliol college, Oxford. In 1582, he took his degree of maſter of arts, and ſoon became a celebrated preacher; and to this talent he chiefly owed his preferment. Upon his firſt ſermon at Worceſter, he was choſen lecturer in that city, and ſoon after rector of All-ſaints in the ſame place. John Stanhope, Eſq; happening to hear him preach at Paul's-croſs, was ſo pleaſed with him, that he immediately preſented him to the rich living of Bingham in Nottinghamſhire. In 1597, he took his degree of doctor in divinity: and, in the beginning of king James's reign, was appointed chaplain in ordinary to his Majeſty; who had ſuch an opinion of him as a writer, that he ordered the doctor's book *De Antichriſto* to be printed with his own commentary upon part of the Apocalypſe. In 1609, he was elected maſter of Baliol college; which truſt he diſcharged with the utmoſt care and aſſiduity, by his frequent lectures to the ſcholars, by his continual preſence at public exerciſes, and by promoting temperance in the ſociety. In November 1610, he was made prebendary of Normanton in the church of Southwell; and, in 1612, his Majeſty appointed him regius profeſſor of divinity at Oxford. The fame of his lectures became very great; and thoſe which he gave upon the ſupreme power of kings againſt Bellarmine and Suarez, ſo much pleaſed his Majeſty, that, when the ſee of Saliſbury became vacant, he named him to that biſhoprick, and he was conſecrated by his own brother at Lambeth, December 3, 1615. When he came to Saliſbury, he found the cathedral running to decay, through the negligence and covetouſneſs of the clergy belonging to it: however, he found means to draw five hundred pounds from the prebendaries, which he applied to the reparation of this church. He then gave himſelf up to the duties of his function with great diligence and aſſiduity, viſiting his whole dioceſe in perſon, and preaching every Sunday whilſt health would permit. But this was not long: for his ſedentary life, and cloſe application to ſtudy, brought upon him the gravel and ſtone; of which he died on the 2d of March 1618, in the fifty-eighth year of his age; having not filled the ſee quite two years and three months, and being one of the five biſhops which Saliſbury had in ſix years. He was buried oppoſite to the biſhop's ſeat in the cathedral. Dr. Fuller*, ſpeaking of the two brothers, ſays, "that George was the more "plauſible preacher, Robert the greateſt ſcholar; "George the ableſt ſtateſman, Robert the deepeſt di-"vine; gravity did frown in George, and ſmile in "Robert." He publiſhed ſeveral pieces; he alſo left behind him ſundry manuſcripts, which Dr Corbet made a preſent of to the Bodleian library.

ABBOTSBROMLEY, a town in Staffordſhire, with a market on Tueſday. After the diſſolution of the monaſteries, it was given to the Lord Paget; and has ſince been called *Paget's Bromley*, and is ſo denominated in the county map. But it retains its old name in the king's books, and is a diſcharged vicarage of 20l. clear yearly value. It likewiſe retains its old name with regard to the fairs. W. Long. 1. 2. Lat. 52. 45.

ABBOTSBURY, a ſmall town in Dorſetſhire, with a market on Thurſday. W. Long. 1. 17. Lat. 50. 40. The abbey near this town was founded by a Norman lady, about the year 1026; and Edward the Confeſſor and William the Conqueror were conſiderable benefactors to it.

ABBREVIATE *of* ADJUDICATIONS, in Scots law, an abſtract or abridgment of a decreet of adjudication, which is recorded in a regiſter kept for that purpoſe.

ABBREVIATION, or ABBREVIATURE, a contraction of a word or paſſage; made by dropping ſome of the letters, or by ſubſtituting certain marks or characters in their place.—Lawyers, phyſicians, &c. uſe abundance of abbreviations, partly for the ſake of expedition, and partly for that of myſtery; but of all people the Rabbins are the moſt remarkable for this practice, ſo that their writings are unintelligible without the Hebrew abbreviatures. The Jewiſh authors and copyiſts do not content themſelves with abbreviating words like the Greeks and Latins, by retrenching ſome of the letters and ſyllables; they frequently take away all but the initial letters. They even frequently take the initials of ſeveral ſucceeding words, join them together, and, adding vowels to them, make a ſort of barbarous word, repreſentative of all thoſe which they have thus abridged. Thus, Rabbi Moſes ben Maiemen, in their abbreviature is *Rambam*, &c.

ABBREVIATOR, in a general ſenſe, a perſon who abridges any large book into a narrower compaſs.

ABBREVIATORS, a college of 72 perſons in the chancery of Rome, who draw up the pope's brieves, and reduce petitions, when granted by him, into proper form for being converted into bulls.

ABBUTALS, ſignify the buttings or boundings of land towards any point. Limits were anciently diſtinguiſhed by artificial hillocks, which were called *botemines*; and hence *butting*. In a deſcription of the ſite of land, the ſides on the breadth are more properly *adjacents*, and theſe terminating the length are *abbutantes*; which, in old ſurveys, were ſometimes expreſſed by *capitare*, to head, whence abbutals are now called *head-lands*.

ABCEDARY, or ABCEDARIAN, an epithet given to compoſitions, the parts of which are diſpoſed in the order of the letters of the alphabet: thus we ſay, Abcedarian pſalms, lamentations, hymns, &c.

ABCOURT, a town near St Germains, four leagues from Paris. Here is a briſk chalybeate water, impregnated with fixed air and the foſſil alkali; and reſembling the waters of Spa and Ilmington.

ABDALLA, the ſon of Abdalmothleb, was the father of the prophet Mahomet. Several other Arabians of eminence bore the ſame name.

ABDALMALEK, the ſon of Mirvan, and the 5th khalif of the race of the Ommiades, ſurnamed *Raſch al Hegianat*, *i. e.* the ſkinner of a ſtone, becauſe of his extreme avarice; as alſo *Aboulzebab*, becauſe his breath was ſaid to be ſo poiſonous as to kill all the flies which reſted on his face. Yet he ſurpaſſed all his predeceſſors in power and dominion; for in his reign the Indies were conquered in the eaſt, and his armies penetrated Spain in the weſt: he likewiſe extended his empire towards the ſouth, by making himſelf maſter of Medina and Mecca. He began his reign in the 65th of the hegira, A. D. 648; reigned 15 years; and four of his ſons enjoyed the khalifate one after another.

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* Worthies of England in Surrey.

ABDALMELEK, (Ben Zohar), an eminent phyſician, commonly called by the Europeans *Avenzoar*. See AVENZOAR.

ABDALMOTHLEB, or ABDAL MATELEB, the ſon of Haſhem, the father of Abdalla, and grandfather of Mahomet the prophet of the Muſſulmans, was, it is ſaid, of ſuch wonderful comelineſs and beauty, that all women who ſaw him became enamoured: which may have given occaſion to that prophetic light, which, according to the Arabians, ſhone in the foreheads of him, his anceſtors, and deſcendents; it being certain that they were very handſome and graceful men. He died when Mahomet, of whom he had taken peculiar care, was only 8 or 9 years old; aged, according to ſome, 110, and according to other writers 120.

ABDALONYMUS, or ABDOLONYMUS, (in claſſic hiſtory), of the royal family of Sidon, and deſcended from king Cinyras, was contented to live in obſcurity, and get his ſubſiſtence by cultivating a garden, while Strato was in poſſeſſion of the crown of Sidon. Alexander the Great having depoſed Strato, inquired whether any of the race of Cinyras was living, that he might ſet him on the throne. It was generally thought that the whole race was extinct: but at laſt Abdalonymus was thought of, and mentioned to Alexander; who immediately ordered ſome of his ſoldiers to fetch him. They found the good man at work, happy in his poverty, and entirely a ſtranger to the noiſe of arms, with which all Aſia was at that time diſturbed; and they could ſcarcely perſuade him that they were in earneſt. Alexander was convinced of his high deſcent by the dignity that appeared in his perſon; but was deſirous of learning from him in what manner he bore his poverty. "I wiſh" ſaid Abdalonymus, "I may bear my new condition as well: Theſe hands have ſupplied my neceſſities: I have had nothing, and I have wanted nothing." This anſwer pleaſed Alexander ſo much, that, beſides giving him all that was Strato's, he augmented his dominions, and gave him a large preſent out of the Perſian ſpoils.

ABDALS, in the Eaſtern countries, a kind of ſaints ſuppoſed to be inſpired to a degree of madneſs. The word comes, perhaps, from the Arabic, *Abdallah*, the ſervant of God. The Perſians call them *devaneh khoda*, ſimilar to the Latins way of ſpeaking of their prophets and ſibyls, *q. d. furentes deo*, raging with the god. They are often carried by exceſs of zeal, eſpecially in the Indies, to run about the ſtreets, and kill all they meet of a different religion; of which travellers furniſh many inſtances. The Engliſh call this *running a muk*, from the name of the inſtrument, a ſort of poniard, which they employ on theſe deſperate occaſions. If they are killed, as it commonly happens, before they have done much miſchief, they reckon it highly meritorious; and are eſteemed, by the vulgar, martyrs for their faith.

ABDARA, or ABDERA, (anc. geog.) a town of Bœotia in Spain, a Phœnician colony; now *Adra*, to the weſt of Almeira in the kingdom of Granada.

ABDERA, (anc. geog.) a maritime town of Thrace, not far from the mouth of the river Neſſus, on the eaſt ſide. The foundation, according to Herodotus, was attempted to be laid by Timeſius the Clazomenian; but he was forced by the Thracians to quit the deſign. The Teians undertook it, and ſucceeded; ſettling there, in order to avoid the inſults of the Perſians. —Several ſingularities are told of Abdera*. The graſs of the country round it was ſo ſtrong, that ſuch horſes as eat of it ran mad. In the reign of Caſſander king of Macedon, this city was ſo peſtered with frogs and rats, that the inhabitants were forced to quit it for a time. —The Abderites, or Abderitani, were very much derided for their want of wit and judgment: yet their city has given birth to ſeveral eminent perſons; as, Protagoras, Democritus, Anaxarchus, Hecatæus the hiſtorian, Nicenætus the poet, and many others, who were mentioned among the illuſtrious men.—In the reign of Lyſimachus, Abdera was inflicted for ſome months with a moſt extraordinary diſeaſe†: this was a burning fever, whoſe criſis was always on the ſeventh day, and then it left them; but it ſo diſtracted their imaginations, that they fancied themſelves players. After this, they were ever repeating verſes from ſome tragedy, and particularly out of the Andromeda of Euripides, as if they had been upon the ſtage; ſo that many of theſe pale, meagre actors, were pouring forth their tragic exclamations in every ſtreet. This delirium continued till the winter following; which was a very cold one, and therefore fitter to remove it. Lucian, who has deſcribed this diſeaſe, endeavours to account for it in this manner: Archelaus, an excellent player, acted the Andromeda of Euripides before the Abderites, in the height of a very hot ſummer. Several had a fever at their coming out of the theatre; and as their imaginations were full of the tragedy, the delirium which the fever raiſed repreſented perpetually Andromeda, Perſeus, Meduſa, &c. and the ſeveral dramatic incidents, and called up the ideas of thoſe objects, and the pleaſure of the repreſentation, ſo ſtrongly, that they could not forbear imitating Archelaus's action and declamation: And from theſe the fever ſpread to others by infection.

ABDERAHMA, a Saracen viceroy in Spain, who revolted, and formed an independent principality at Cordova. He had ſeveral ſucceſſors of the ſame name.

ABDEST, a Perſian word, properly ſignifying the water placed in a baſon for waſhing the hands; but is uſed to imply the legal purifications practiſed by the Mahometans before they enter on their religious ceremonies.

ABDIAS OF BABYLON, one of the boldeſt legend-writers, who boaſted he had ſeen our Saviour, that he was one of the 72 diſciples, had been eye-witneſs of the actions and prayers at the deaths of ſeveral of the apoſtles, and had followed into Perſia St Simon and St Jude, who, he ſaid, made him the firſt biſhop of Babylon. His book intitled *Hiſtoria certaminis apoſtolici*, was publiſhed by Wolfgang Lazius, at Baſil, 1551; and it has ſince borne ſeveral impreſſions in different places.

ABDICATION, the action whereby a magiſtrate, or perſon in office, renounces and gives up the ſame before the term of ſervice is expired.

This word is frequently confounded with *reſignation*; but differs from it, in that abdication is done purely and ſimply, whereas reſignation is in favour of ſome third perſon. It is ſaid to be a renunciation, quitting, and relinquiſhing, ſo as to have nothing further to do with a thing; or the doing of ſuch actions as are inconſiſtent with the holding of it. On king James's leaving the kingdom, and abdicating the government, the

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* Plinii, lib. xxv. c. 8. Juſt. lib. xv. c. 2.

† Lucianus *quomodo Hiſt ſit conſcribendus, initio.*

lords would have had the word *deſertion* made uſe of; but the commons thought that it was not comprehenſive enough, for that the king might then have liberty of returning.—Among the Roman writers it was more particularly uſed for the act whereby a father diſcarded or diſclaimed his ſon, and expelled him the family. It is diſtinguiſhed from *exhæredatio* or *diſinheriting*, in that the former was done in the father's lifetime; the latter, by will at his death: ſo that whoever was abdicated, was alſo diſinherited; but not *vice verſa*.

ABDOMEN, in anatomy, is that part of the trunk of the body which lies between the thorax and the bottom of the pelvis. See Anatomy.

ABDOMINALES, or Abdominal Fishes, conſtitute the IVth Order of the *Fourth Claſs* of Animals, in the Linnæan ſyſtem. See Zoology.

ABDUCTION, in Logic, a kind of argumentation, by the Greeks called *apagoge*, wherein the greater extreme is evidently contained in the medium, but the medium not ſo evidently in the leſſer extreme as not to require ſome farther medium or proof to make it appear. It is called *abduction*, becauſe, from the concluſion, it draws us on to prove the propoſition aſſumed. Thus, in the ſyllogiſm, "All whom God abſolves are free from ſin; but God abſolves all who are in Chriſt; therefore all who are in Chriſt are free from ſin,"—the major is evident; but the minor, or aſſumption, is not ſo evident without ſome other propoſition to prove it, as, "God received full ſatisfaction for ſin by the ſufferings of Jeſus Chriſt."

Abduction, in ſurgery, a ſpecies of fracture, wherein the broken parts of the bone recede from each other.

ABDUCTOR, or Abducent, in anatomy, a name given to ſeveral of the muſcles, on account of their ſerving to withdraw, open, or pull back the parts to which they belong.

ABEL, ſecond ſon of Adam and Eve, was a ſhepherd. He offered to God ſome of the firſtlings of his flock, at the ſame time that his brother Cain offered the fruits of the earth. God was pleaſed with Abel's oblation, but diſpleaſed with Cain's; which ſo exaſperated the latter, that he roſe up againſt his brother and killed him. Theſe are the only circumſtances Moſes relates of him; though, were we to take notice of the ſeveral particulars to which curioſity has given birth on this occaſion, they would run to a very great length. But this will not be expected. It is remarkable, that the Greek churches, who celebrate the feaſts of every other patriarch and prophet, have not done the ſame honour to Abel. His name is not to be found in any catalogue of ſaints or martyrs till the 10th century; nor even in the new Roman martyrology. However he is prayed to, with ſome other ſaints, in ſeveral Roman litanies ſaid for perſons who lie at the point of death.

Abel Keramim, or *Vincarum*, beyond Jordan, in the country of the Ammonites, where Jephthah defeated them, ſeven miles diſtant from Philadelphia, abounding in vines, and hence the name. It was alſo called *Abela*.

Abel-Mehola, the country of the prophet Eliſha, ſituate on this ſide Jordan between the valley of Jezreel and the village Bethmaela in the plains of Jordan, where the Midianites were defeated by Gideon. Judges vii. 22.

Abel-Mizraim, called alſo the Threſhing-floor of Atad; ſignifying the lamentation of the Egyptians; in alluſion to the mourning for Jacob, Gen. i. 3, 10, 11. Suppoſed to be near Hebron.

Abel-Moſch, or *Abelmuſch*, in botany, the trivial name of a ſpecies of the Hibiscus.

Abel-Sattim, or *Sittim*, a town in the plains of Moab, to the N. E. of the Dead Sea, not far from Jordan, where the Iſraelites committed fornication with the daughters of Moab: So called, probably, from the great number of ſittim-trees there.

ABELARD (Peter), one of the moſt famous doctors of the twelfth century, was born at Palais near Nantz, in Britany: he was well learned in divinity, philoſophy, and the languages; but was particularly diſtinguiſhed by his ſkill in logic, and his fondneſs for diſputations, which led him to travel into ſeveral provinces in order to give public proof of his acuteneſs in that ſcience.

After having baffled many antagoniſts, he read lectures in divinity with great applauſe at Paris; where he boarded with a canon whoſe name was Fulbert, and who had a very beautiful niece named Heloiſe. The canon ardently wiſhed to ſee this young lady make a figure among the learned, and Abelard was made her preceptor: but inſtead of inſtructing her in the ſciences, he taught her to love. Abelard now performed his public functions very coldly, and wrote nothing but amorous verſes. Heloiſe proving with child, Abelard ſent her to a ſiſter of his in Britany, where ſhe was delivered of a ſon. To ſoften the canon's anger, he offered to marry Heloiſe privately; and the old man was better pleaſed with the propoſal than the niece; who, from a ſingular exceſs of paſſion, choſe to be Abelard's miſtreſs rather than his wife. She married, however; but uſed often to proteſt upon oath that ſhe was ſingle, which provoked the canon to uſe her ill. Upon this, Abelard ſent her to the monaſtery of Argenteuil; where ſhe put on a religious habit, but did not take the veil. Heloiſe's relations conſidering this as a ſecond treachery, hired ruffians, who, forcing into his chamber in the dead of the night, emaſculated him. This infamous treatment made him fly to the gloom of a cloiſter. He aſſumed the monaſtic habit in the abbey of St Dennis; but the diſorders of that houſe ſoon drove him from thence. He was afterwards charged with hereſy; but after ſeveral perſecutions for his religious ſentiments, he ſettled in a ſolitude in the dioceſe of Troies, where he built an oratory, to which he gave the name of the Paraclet. He was afterwards choſen ſuperior of the abbey of Ruis in the dioceſe of Vannes: when the nuns being expelled from the nunnery in which Heloiſe had been placed, he gave her his oratory; where ſhe ſettled with ſome of her ſiſter nuns, and became their prioreſs.

Abelard mixed the philoſophy of Ariſtotle with his divinity, and in 1140 was condemned by the council of Rheims and Sens. Pope Innocent II. ordered him to be impriſoned, his books to be burnt, and forbid him ever teaching again. However, he was ſoon after pardoned, at the ſolicitation of Peter the Venerable, who received him into his abbey of Clugni, where he led an exemplary life. He died in the priory of Marcellus at Chalons, April 21, 1142, aged ſixty-three. His corpſe was ſent to Heloiſe, who buried it in the Paraclet. He left ſeveral works: the moſt celebrated of which are thoſe tender letters that paſſed between him and Heloiſe, with the account of their misfortunes prefixed; which have been tranſlated into Engliſh, and immortaliſed by the harmony of Mr Pope's numbers.

ABEL-TREE, or ABLE-TREE, an obſolete name for a ſpecies of the poplar. See POPULUS.

ABELIANS, ABEOLITES, or ABELONIANS, in church-hiſtory, a ſect of heretics mentioned by St Auſtin, which aroſe in the dioceſe of Hippo in Africa, and is ſuppoſed to have begun in the reign of Arcadius, and ended in that of Theodoſius. Indeed it was not calculated for being of any long continuance. Thoſe of this ſect regulated marriage after the example of Abel; who, they pretended, was married, but died without ever having known his wife. They therefore allowed each man to marry one woman, but enjoined them to live in continence: and, to keep up the ſect, when a man and woman entered into this ſociety, they adopted a boy and a girl, who were to inherit their goods, and to marry upon the ſame terms of not begetting children, but of adopting two of different ſexes.

ABELLA, anciently a town of Campania, near the river Clanius. The inhabitants were called Abellani, and ſaid to have been a colony of Chalcidians. The nux Avellana, called alſo Præneſtina, or the hazelnut, takes its name from this town, according to Macrobius. Now *Avella*.

ABELLINUM, anciently a town of the Hirpini, a people of Apulia; diſtant about a mile from the rivulet Sabbato, between Beneventum and Salernum. Pliny calls the inhabitants Abellinates, with the epithet Protopi, to diſtinguiſh them from the Abellinates Marſi. Now *Avellino*. E. Long. 15. 20. Lat. 21.

ABEN EZRA (Abraham), a celebrated rabbi, born at Toledo in Spain, called by the Jews, The wiſe, great and admirable Doctor, was a very able interpreter of the Holy Scriptures; and was well ſkilled in grammar, poetry, philoſophy, aſtronomy, and medicine. He was alſo a perfect maſter of the Arabic. His principal work is, Commentaries on the Old Teſtament, which is much eſteemed: theſe are printed in Bomberg's and Buxtorf's Hebrew Bibles. His ſtyle is clear, elegant, conciſe, and much like that of the Holy Scriptures: he almoſt always adheres to the literal ſenſe, and every where gives proofs of his genius and good ſenſe: he, however, advances ſome erroneous ſentiments. The ſcarceſt of all his books is entitled, Jeſud Mora; which is a theological work, intended as an exhortation to the ſtudy of the Talmud. He died in 1174, aged 75.

ABEN Meller, a learned rabbin, who wrote a commentary on the Old Teſtament in Hebrew, intitled The Perfection of Beauty. This rabbin generally follows the grammatical ſenſe and the opinions of Kimchi. The beſt edition is that of Holland.

ABENAS, a town of France, in Languedoc and in the lower Vivarais, ſeated on the river Ardeſch, at the foot of the Cevennes. E. Long. 4. 43. Lat. 44. 40.

ABENEL GAUBY, a fixed ſtar of the ſecond or third magnitude, on the ſouth ſcale of the conſtellation LIBRA.

ABENSPERG, a ſmall town of Germany, in the circle and duchy of Bavaria, and in the government of Munich. It is ſeated on the river Abentz, near the Danube. E. Long. 11. 38. Lat. 48. 45.

ABERAVON, a borough-town of Glamorganſhire in Wales, governed by a portreeve. It had a market, which is now diſcontinued: the vicarage is diſcharged, and is worth 45l. clear yearly value. It is ſeated at the mouth of the river Avon, 194 miles weſt of London. W. Long. 3. 21. Lat. 51. 40.

ABERBROTHICK, or ARBROATH, one of the royal boroughs of Scotland, ſituated in the county of Angus, about forty miles N. N. E. of Edinburgh; its W. Long. being 2. 29. and N. Lat. 56. 36. It is ſeated on the diſcharge of the little river Brothick into the ſea, as the name imports, *Aber* in the Britiſh implying ſuch a ſituation. It is a ſmall but flouriſhing place, well built, and ſtill increaſing. The town has been in an improving ſtate for the laſt forty years, and the number of inhabitants greatly augmented; which is owing to the introduction of manufactures. The number, at this time, is ſaid to be about four thouſand: theſe principally conſiſt of weavers of coarſe brown linens, and ſome ſail-cloth; others are employed in making white and coloured threads: the remainder are either engaged in the ſhipping of the place, or in the neceſſary and common mechanic trades. The brown linens, or Oſnaburghs, were manufactured here before any encouragement was given by government, or the linen company erected at Edinburgh. It appears from the books of the ſtamp-office in this town, that ſeven or eight hundred thouſand yards are annually made in the place, and a ſmall diſtrict round. Beſides this export and that of thread, much barley and ſome wheat is ſent abroad. The foreign imports are flax, flax-ſeed, and timber, from the Baltic. The coaſting trade conſiſts of coals from Borrowſtounneſs, and lime from Lord Elgin's kilns in Fife.—At this place, in default of a natural harbour, a tolerable artificial one of piers has been formed, where, at ſpring-tides, which riſe here fifteen feet, ſhips of two hundred tons can come, and of eighty at neap-tides; but they muſt lie dry at low water. This port is of great antiquity: there is an agreement yet extant between the abbot and the burghers of Aberbrothick, in 1194, concerning the making of the harbour. Both parties were bound to contribute their proportions; but the largeſt fell to the ſhare of the former, for which he was to receive an annual tax payable out of every rood of land lying within the borough.—The glory of this place was the abbey, whoſe very ruins give ſome idea of its former magnificence. It was founded by William the Lion in 1178, and dedicated to the celebrated primate Thomas à Becket. The founder was buried here; but there are no remains of his tomb, or of any other, excepting that of a monk of the name of Alexander Nicol. The monks were of the Tyronenſian order; and were firſt brought from Kelſo, whoſe abbot declared thoſe of this place, on the firſt inſtitution, to be free from his juriſdiction. The laſt abbot was the famous Cardinal Beaton, at the ſame time archbiſhop of St Andrew's, and, before his death, as great and abſolute here as Wolſey was in England. King John, the Engliſh monarch, granted this monaſtery moſt uncommon privileges; for, by charter under his great ſeal, he exempted it *a teloniis et conſuetudine* in every part of England, except London. At Aberbrothick is a chalybeate water, ſimilar to thoſe of Peterhead and Glendy.

ABERCONWAY, or CONWAY, Caernarvonſhire, North-Wales; ſo called from its ſituation at the mouth of the river Conway. It is a handſome town, pleaſantly ſituated on the ſide of a hill, and has many conveniences for trade; notwithſtanding which it is the pooreſt town in the county. It was built by Edward I. and had not only walls, but a ſtrong caſtle which is now in ruins. Here is an inſcription on the tomb of one Nicholas Hooks, importing that he was the one-and fortieth child of his father, and had twenty-ſeven children himſelf. It is 229 miles from London, W. Long. 3. 47. N. Lat. 53. 20.

ABERDEEN, the name of two cities in Scotland, called the *Old* and *New Towns*, ſituated on the German ocean, in W. Long. 1. 40. and N. Lat. 57. 19.

Aberdeen is a place of great antiquity. According to tradition, it was of note in the reign of Gregory, who conferred on it ſome privileges about the year 893. In 1004, Malcolm II. founded a biſhoprick at a place called Mortlich in Banffſhire, in memory of a ſignal victory which he there gained over the Danes: which biſhoprick was tranſlated to Old Aberdeen by David I.; and in 1163, the then biſhop of Aberdeen obtained a new charter from Malcolm IV. There is extant a charter of Alexander II. by which, in 1217, the King grants to Aberdeen the ſame privileges he had granted to his town of Perth.

The Old Town lies about a mile to the north of the new, at the mouth of the river Don, over which is a fine Gothic bridge, of a ſingle arch, greatly admired, which reſts at both ſides on two rocks. This arch, ſaid to have been built by a biſhop of Aberdeen about the year 1290, is 67 feet wide at the bottom, and 34½ feet high above the ſurface of the river, which at ebb-tide is here 19 feet deep. The old town was formerly the ſeat of the biſhop, and had a large cathedral commonly called *St Macher's*. Two very antique ſpires, and one aiſle, which is uſed as a church, are now the only remains of it. The biſhoprick was founded in the time of David I. as above mentioned. The cathedral had anciently two rows of ſtone pillars acroſs the church, and three turrets; the ſteeple, which was the largeſt of theſe turrets, reſted upon an arch, ſupported by four pillars. In this cathedral there was a fine library; but, about the year 1560, it was almoſt totally deſtroyed. But the capital building is the King's-college, on the ſouth ſide of the town, which is a large and ſtately fabric. It is built round a ſquare, with cloiſters on the ſouth ſide. The chapel is very ruinous within; but there ſtill remains ſome wood-work of exquiſite workmanſhip. This was preſerved by the ſpirit of the principal at the time of the reformation, who armed his people and checked the blind zeal of the barons of the Mearns; who, after ſtripping the cathedral of its roof, and robbing it of the bells, were going to violate this ſeat of learning. They ſhipped their ſacrilegious booty, with an intention of expoſing it to ſale in Holland: but the veſſel had ſcarcely gone out of port, when it periſhed in a ſtorm with all its ill-gained lading. The ſteeple is vaulted with a double croſs arch; above which is an imperial crown, ſupported by eight ſtone pillars, and cloſed with a globe and two guilded croſſes. In the year 1631 this ſteeple was thrown down by a ſtorm, but was ſoon after rebuilt in a more ſtately form. This college was founded in 1494, by William Elphinſton, biſhop of this place, Lord Chancellor of Scotland in the reign of James III. and Lord Privy Seal in that of James IV. But James IV. claimed the patronage of it, and it has ſince been called the *King's College*. This college and the Mariſchal-college in the New Town, form one univerſity, called the *Univerſity of King Charles*. The library is large, but not remarkable for many curioſities. Hector Boethius was the firſt principal of the college; and ſent for from Paris for that purpoſe, on an annual ſalary of forty marks Scots, at thirteen pence each. The ſquare tower on the ſide of the college was built by contributions from General Monk and the officers under him then quartered at Aberdeen, for the reception of ſtudents; of which there are about a hundred belonging to the college who lie in it.

The New Town is the capital of the ſhire of Aberdeen. For largeneſs, trade, and beauty, it greatly exceeds any town in the north of Scotland. It is built on a hill or riſing ground, and lies on a ſmall bay formed by the Dee, deep enough for a ſhip of 200 tons, and above two miles in circumference.—The buildings (which are of granite from the neighbouring quarries) are generally four ſtories high; and have, for the moſt part, gardens behind them, which gives it a beautiful appearance. On the high-ſtreet is a large church, which formerly belonged to the Franciſcans. This church was begun by Biſhop William Elphinſton; and finiſhed by Gavinus Dunbar, biſhop of Aberdeen, about the year 1500. Biſhop Dunbar is ſaid likewiſe to have built the bridge over the Dee, which conſiſts of ſeven arches. In the middle of Caſtle-ſtreet is an octagon building, with neat bas-relievos of the kings of Scotland from James I. to James VII. The town-houſe makes a good figure, and has a handſome ſpire in the centre. The grammar-ſchool is a low but neat building. Gordon's hoſpital is handſome; in front is a good ſtatue of the founder: it maintains forty boys, who are apprenticed at proper ages. The infirmary is a large plain building, and ſends out between eight and nine hundred cured patients annually. But the chief public building in the new town is the Mariſchal-college, founded by George Keith earl of Mariſchal, in the year 1593; but ſince greatly augmented with additional buildings. There are about 140 ſtudents belonging to it. In both the Mariſchal and King's-college the languages, mathematics, natural philoſophy, divinity, &c. are taught by very able profeſſors. The convents of Aberdeen were: One of the Mathurines, or of the order of the Trinity, founded by William the Lion, who died in 1214; another of Dominicans, by Alexander II.; a third of Obſervantines, a building of great length in the middle of the city, founded by the citizens and Mr. Richard Vans, &c.; and a fourth of Carmelites, or White Friars, founded by Philip de Arbuthnot in 1350.

Aberdeen, including the Old Town, is ſuppoſed to contain 25,000 people. Its trade is conſiderable, but might be greatly extended by an attention to the white fiſheries.

The harbour was long a great detriment to its trade, and occaſioned the loſs of many lives and much property. A ſtranger could never depend upon finding it as he left it; while veſſels lay at anchor in the road till the tide ſhould make, they have often been wrecked by ſtorms which ſuddenly aroſe. It was very narrow at the mouth, having the eaſterly rocky point of the Grampian mountains on the ſouth, and a flat blowing ſand on the north, extending along the coaſt for many miles. By the eaſterly and north-eaſt ſtorms the ſand was driven in a long ridge acroſs the harbour's mouth, and formed what was called the *bar*. Upon this bar the depth of water at low tide was ſometimes not above three feet. Clearing away the ſand, though but a partial and temporary remedy, was a matter of great expence to the community: If it was cleared one week, ſo as to have five or ſix feet of water at ebb, a freſh ſtorm the next week undid all that had been done. The town at laſt came to the reſolution of erecting a ſtrong pier on the north ſide of the harbour. This pier is 1200 feet in length, and gradually increaſes in thickneſs and height as it approaches the ſea, where the head or rounding is 60 feet diameter at the baſe, and the perpendicular elevation is 38 feet. The whole is built of granite, the moſt durable ſtone known: many of the outſide ſtones are above three tons weight, with hewn beds. It was built under the direction of Mr. Smeaton; and the expence, amounting to above 17,000*l.*, is defrayed by doubling the harbour-dues, which are chiefly paid by the inhabitants.

A little to the ſouth of the bar, they have now a depth of 17 fathoms at low water; and at the harbour mouth, from eight to nine fathoms, where they had formerly but a few feet.

Aberdeen once enjoyed a good ſhare of the tobacco trade. At preſent, its imports are from the Baltic, and a few merchants trade to the Weſt Indies and this country. Its exports are ſtockings, thread, ſalmon, and oatmeal. The firſt is a moſt important article, as appears by the following ſtate of it. For this manufacture, 20,800 pounds worth of wool is annually imported, and 1600 pounds worth of oil. Of this wool are annually made 69,333 dozen pairs of ſtockings, worth, at an average, 1*l.* 10*s. per* dozen. Theſe are the work of the country people in almoſt all parts of this great county, who get 4*s. per* dozen for ſpinning, and 14*s. per* dozen for knitting; ſo that there is annually paid them 62,329*l.* 14*s.* There is, beſides, about 2000*l.* value of ſtockings manufactured from the wool of the county. The thread manufacture is another conſiderable article, though trifling in compariſon of the woolen. The ſalmon fiſheries on the Dee and the Don are a good branch of trade. About 46 boats, and 130 men, are employed on the firſt; and, in ſome years, 167,000 ℔. of fiſh have been ſent pickled to London, and about 930 barrels of ſalted fiſh exported to France, Italy, &c.—The fiſhery on the Don is far leſs conſiderable. The fiſh of this river are taken in cruives above the bridge; a practice contrary to the ancient laws of the kingdom, unleſs where the nature of the water rendered the net-fiſhery impracticable. The inhabitants likewiſe export conſiderable quantities of pickled pork, which they ſell to the Dutch for victualling their Eaſt India ſhips and men of war; the Aberdeen pork having the reputation of being the beſt cured of any in Europe for keeping on long voyages.

"It is however remarkable (Mr. Knox obſerves), that there is not a ſingle decked veſſel fitted out from Aberdeen for the herring or white fiſheries: here is now an excellent harbour; an active people, converſant in trade, and poſſeſſed of capital; ſeated within ſix hours ſailing of Long Fortys, and two days ſailing of the Shetland Iſles. This inattention is the more extraordinary, as the exports of Aberdeen, though very conſiderable, do not balance the imports in value. The herring and white fiſheries, therefore, if proſecuted with vigour, cured and dried with judgment, would not only extend the ſcale of exports, but alſo furniſh the outward bound veſſels with freights, and better aſſortments for the foreign markets. The ſalmon of the Dee and Don are taken in great abundance, cured in the higheſt perfection, and greatly valued at the European markets. If the merchants, in addition to theſe, ſhould alſo export the cargoes of 50 or 60 veſſels conſtantly employed in the herring and white fiſheries, the port of Aberdeen would in a few years become the moſt celebrated mart of fiſh now exiſting."

From a round hill at the weſt end of the city, flow two ſprings, one of pure water and the other of a quality reſembling the German Spa. Aberdeen, with Aberbrothick, Brechin, Montroſe, and Inverbervie, returns one member to Parliament.

ABERDEENSHIRE, comprehends the diſtricts of Mar, Garioch, Strathbogie, and the greater part of Buchan; and ſends one member to Parliament. It is waſhed on the eaſt and north by the ocean; and abounds in ſea-ports, from whence there is a ſafe and ready paſſage to the Orkneys and Shetland Iſles, the Greenland fiſheries, Norway, and the regions round the Baltic, the German coaſt, Holland, Flanders, France. It is watered by numerous ſtreams, all of them the reſort of ſalmon, and whoſe banks diſplay the moſt extenſive plantations as well as natural woods in Britain.

ABERDOUR, a ſmall town in Fifeſhire, Scotland, on the frith of Forth, about ten miles N. W. of Edinburgh. In old times it belonged to the Viponts; in 1126 it was transferred to the Mortimers by marriage, and afterwards to the Douglaſes. William, lord of Liddeſdale, ſurnamed the *Flower of Chivalry*, in the reign of David II. by charter conveyed it to James Douglas, anceſtor of the preſent noble owner the Earl of Morton. The monks of Inchcolm had a grant for a burial-place here from Allan de Mortimer, in the reign of Alexander III. The nuns, uſually ſtyled the poor *Clares*, had a convent at this place.

ABERFORD, a market town in the weſt-riding of Yorkſhire, ſtands in a bottom; and is about a mile long, and indifferently well built. It is near a Roman road, which is raiſed very high, and not far from the river Cock; between which and the town there is the foundation of an old caſtle ſtill viſible. It is 181 miles N. by W. from London. W. Long. 2. 45. Lat. 55. 52.

ABERGAVENNY, a large, populous, and flouriſhing town in Monmouthſhire, ſeated at the confluence of the rivers Uſk and Gavenny. It has a fine bridge over the Uſk, conſiſting of fifteen arches; and being a great thoroughfare from the weſt part of Wales to Bath, Briſtol, Glouceſter, and other places, is well furniſhed with accommodations for travellers. It is ſurrounded with a wall, and had once a caſtle. It carries on a conſiderable trade in flannels, which are brought hither for ſale from the other parts of the county.

country. It is 142 miles diſtant from London. W. Long. 2. 45. Lat. 51. 50. Abergavenny appears to have been the *Gibbanium* of Antoninus, and the town of Uſk his *Burrium*.

ABERNETHY (John), an eminent diſſenting miniſter, was the ſon of Mr. John Abernethy a diſſenting miniſter in Colraine, and was born on the 19th of October 1680. When about nine years of age, he was ſeparated from his parents, his father being obliged to attend ſome public affairs in London; and his mother, to ſhelter herſelf from the mad fury of the Iriſh rebels, retiring to Derry, a relation who had him under his care, having no opportunity of conveying him to her, took him with him to Scotland; by which means he eſcaped the hardſhips he muſt have ſuffered at the ſiege of Derry, where Mrs. Abernethy loſt all her other children. He afterwards ſtudied at the univerſity of Glaſgow, till he took the degree of maſter of arts; and, in 1708, he was choſen miniſter of a diſſenting congregation at Antrim, where he continued above twenty years. About the time of the Bangorian controverſy (for which ſee Hoadley), a diſſention aroſe among his brethren in the miniſtry at Belfaſt, on the ſubject of ſubſcription to the Weſtminſter confeſſion; in which he became a leader on the negative ſide, and incurred the cenſure of a general ſynod. Being in conſequence deſerted by the greateſt part of his congregation, he accepted an invitation to ſettle in Dublin, where his preaching was much admired. He was diſtinguiſhed by his candid, free, and generous ſentiments; and died of the gout in Dec. 1740, in the ſixtieth year of his age. He publiſhed a volume of ſermons on the Divine Attributes; after his death a ſecond volume was publiſhed by his friends; and theſe were ſucceeded by four other volumes on different ſubjects: all of which have been greatly admired.

Abernethy, a town in Strathern, a diſtrict of Perthſhire in Scotland. It is ſeated on the river Tay, a little above the mouth of the Erne. It is ſaid to have been the ſeat of the Pictiſh kings; and was afterwards the ſee of an archbiſhop, ſince transferred to St Andrews. It is now greatly decayed.

ABERRATION, in aſtronomy, a ſmall apparent motion of the fixed ſtars diſcovered by the late Dr. Bradley. The diſcovery was made by accident in the year 1725, when Mr Molyneux and Dr Bradley began to obſerve the bright ſtar in the head of *Draco*, marked γ by Bayer, as it paſſed near the zenith, with an inſtrument made by Mr Graham, in order to diſcover the parallax of the earth's annual orbit; and, after repeated obſervations, they found this ſtar, about the beginning of March 1726, to be $20''$ more ſoutherly than at the time of the firſt obſervation. It now indeed ſeemed to have arrived at its utmoſt limits ſouthward; becauſe, in ſeveral trials made about this time, no ſenſible difference was obſerved in its ſituation. By the middle of April, it appeared to be returning back again toward the north; and, about the beginning of June, it paſſed at the ſame diſtance from the zenith as it had done in December, when it was firſt obſerved: in September following, it appeared $39''$ more northerly than it was in March, juſt the contrary way to what it ought to appear by the annual parallax of the ſtars. This unexpected phenomenon perplexed the obſervers very much; and Mr. Molyneux died before the true cauſe of it was diſcovered. After this, Dr. Bradley, with another inſtrument more exact and accurately adapted to this purpoſe, obſerved the ſame appearances not only in that but many other ſtars: and, by the great regularity that appeared in a ſeries of obſervations made in all parts of the year, the Doctor was fully ſatisfied with regard to the general laws of the phenomena; and therefore endeavoured to find out the cauſe of them. He was already convinced, that the apparent motion of the ſtars was not owing to a nutation of the earth's axis. The next thing that offered itſelf, was an alteration in the direction of the plumb line, with which the inſtrument was conſtantly rectified; but this, upon trial, proved inſufficient. Then he had recourſe to what refraction might do; but here alſo nothing ſatisfactory occurred. At laſt this acute aſtronomer found, that the phenomena in queſtion proceeded from the progreſſive motion of light, and the earth's annual motion in its orbit: for he perceived, that if light was propagated in time, the apparent place of a fixed object would not be the ſame when the eye is at reſt, as when it is moving in any other direction, than that of the line paſſing through the eye and object; and that, when the eye is moving in different directions, the apparent place of the object would be different.

Aberration, in optics, is uſed to denote that error or deviation of the rays of light, when inflected by a lens or ſpeculum, whereby they are hindered from meeting or uniting in the ſame point. There are two ſpecies of the aberrations of rays, diſtinguiſhed by their different cauſes; one ariſing from the figure of the glaſs or ſpeculum, the other from the unequal refrangibility of the rays of light. This laſt ſpecies is ſometimes called the Newtonian, from the name of its diſcoverer. See Optics. n° 17. 136. 173.

ABERYSWITH, a market-town of Cardiganſhire, in Wales, ſeated on the Ridal, near its confluence with the Iſtwith, where it falls into the ſea. It is a populous, rich town, and has a great trade in lead, and a conſiderable fiſhery of whiting, cod, and herrings. It was formerly ſurrounded with walls, and fortified with a caſtle; but both are now in ruins. Its diſtance from London is 199 miles weſt-ſouth-weſt. W. Long. 4. 15. Lat. 52. 30.

ABESTA, the name of one of the ſacred books of the Perſian magi, which they aſcribe to their great founder Zoroaſter. The abeſta is a commentary on two others of their religious books called *Zend* and *Pazend*; the three together including the whole ſyſtem of the Ignicold, or worſhippers of fire.

ABETTOR, a law-term, implying one who encourages another to the performance of ſome criminal action, or who is art and part in the performance itſelf. Treaſon is the only crime in which abettors are excluded by law, every individual concerned being conſidered as a principal. It is the ſame with *art-and-part* in the Scots law.

ABEX, a country in High Ethiopia, in Africa, bordering on the Red Sea; by which it is bounded on the eaſt. It has Nubia or Sennar on the north; Sennar and Abyſſinia on the weſt; and Abyſſinia on the ſouth. Its principal towns are Suaquem and Arkeko. It is ſubject to the Turks, and has the name of the Beglerbeg of Habeleth. It is about five hundred miles in length and one hundred in breadth, and is a wretched country; for the heat here is almoſt inſupportable, and the air is ſo unhealthy, that an European cannot ſtay long in it without the utmoſt hazard of his life. It is very mountainous, in ſo much that there are many more wild beaſts than men. There are foreſts in which grow a great number of ebony trees.

ABEYANCE, in law, the expectancy of an eſtate. Thus if lands be leaſed to one perſon for life, with reverſion to another for years, the remainder for years is an abeyance till the death of the leſſee.

ABGAR, or ABGARUS, a name given to ſeveral of the kings of Edeſſa in Syria. The moſt celebrated of them is one who, it is ſaid, was cotemporary with Jeſus Chriſt; and who having a diſtemper in his feet, and hearing of Jeſus's miraculous cures, requeſted him, by letter, to come and cure him. Euſebius*, who believed that this letter was genuine, and alſo an anſwer our Saviour is ſaid to have returned to it, has tranſlated them both from the Syriac, and aſſerts that they were taken out of the archives of the city of Edeſſa. The firſt is as follows: “Abgarus, prince of Edeſſa, to Jeſus the holy Saviour, who hath appeared in the fleſh in the confines of Jeruſalem, greeting. I have heard of thee, and of the cures thou haſt wrought without medicines or herbs. For it is reported thou makeſt the blind to ſee, the lame to walk, lepers to be clean, devils and unclean ſpirits to be expelled, ſuch as have been long diſeaſed to be healed, and the dead to be raiſed; all which when I heard concerning thee, I concluded with myſelf, That either thou waſt a God come down from heaven, or the Son of God ſent to do theſe things. I have therefore written to thee, beſeeching thee to vouchſafe to come unto me, and cure my diſeaſe. For I have alſo heard that the Jews uſe thee ill, and lay ſnares to deſtroy thee. I have here a little city, pleaſantly ſituated, and ſufficient for us both. ABGARUS.” To this letter Jeſus, it is ſaid, returned an anſwer by Ananias, Abgarus's courier; which was as follows: “Bleſſed art thou, O Abgarus! who haſt believed in me whom thou haſt not ſeen; for the ſcriptures ſay of me, They who have ſeen me have not believed in me, that they who have not ſeen, may, by believing, have life. But whereas thou writeſt to have me come to thee, it is of neceſſity that I fulfil all things here for which I am ſent; and having finiſhed them, to return to him that ſent me: but when I am returned to him, I will then ſend one of my diſciples to thee, who ſhall cure thy malady, and give life to thee and thine. JESUS.” After Jeſus's aſcenſion, Judas, who is alſo named Thomas, ſent Thaddeus, one of the ſeventy, to Abgarus; who preached the goſpel to him and his people, cured him of his diſorder, and wrought many other miracles: which was done, ſays Euſebius, A. D. 43.—Though the above letters are acknowledged to be ſpurious by the candid writers of the church of Rome; ſeveral proteſtant authors, as Dr Parker, Dr Cave, and Dr Grabe, have maintained that they are genuine, and ought not to be rejected.

ABGILLUS (John), ſurnamed Preſter John, was ſon to a king of the Friſcii; and, from the auſterity of his life obtained the name of *Preſter*, or Prieſt. He attended Charlemagne in his expedition to the Holy Land; but inſtead of returning with that monarch to Europe, it is pretended that he gained mighty conqueſts, and founded the empire of the Abyſſines, called, from his name, the empire of Preſter John. He is ſaid to have written the hiſtory of Charlemagne's journey into the Holy Land, and of his own into the Indies; but they are more probably trifling romances, written in the ages of ignorance.

ABIANS, anciently a people of Thrace, or (according to ſome authors) of Scythia. They had no fixed habitations; they led a wandering life. Their houſes were waggons, which carried all their poſſeſſions. They lived on the fleſh of their herds and flocks, on milk and cheeſe, chiefly on that of mare's milk. They were unacquainted with commerce. They only exchanged commodities with their neighbours. They poſſeſſed lands, but they did not cultivate them. They aſſigned their agriculture to any who would undertake it, reſerving only to themſelves a tribute; which they exacted, not with a view to live in affluence, but merely to enjoy the neceſſaries of life. They never took arms but to oblige thoſe to make good a promiſe to them by whom it had been broken. They paid tribute to none of the neighbouring ſtates. They deemed themſelves exempt from ſuch an impoſition; for they relied on their ſtrength and courage, and conſequently thought themſelves able to repel any invaſion. The Abians, we are told, were a people of great integrity. This honourable eulogium is given them by Homer. (Strabo.)

ABIATHAR, high-prieſt of the Jews, ſon to Abimelech, who had borne the ſame office, and received David into his houſe. This ſo enraged Saul, who hated David, that he put Abimelech to death, and 81 prieſts; Abiathar alone eſcaped the maſſacre. He afterwards was high-prieſt; and often gave king David teſtimonies of his fidelity, particularly during Abſalom's conſpiracy, at which time Abiathar followed David, and bore away the ark. But after this, conſpiring with Adonijah, in order to raiſe him to the throne of king David his father; this ſo exaſperated Solomon againſt him, that he diveſted him of the prieſthood, and baniſhed him, A. M. 3021, before Chriſt 1014.

ABIB, ſignifying an ear of corn, a name given by the Jews to the firſt month of their eccleſiaſtical year, afterwards called *Niſan*. It commenced at the vernal equinox; and according to the courſe of the moon, by which their months were regulated, anſwered to the latter part of our March and beginning of April.

ABIDING *by* WRITINGS, in Scots law: When a perſon founds upon a writing alleged to be falſe, he may be obliged to declare judicially whether he will ſtand or abide by it as a true deed.

ABIES, the FIR-TREE. See PINUS.

ABIGEAT, an old law term, denoting the crime of ſtealing cattle by droves or herds. This crime was ſeverely puniſhed; the delinquent being often condemned to the mines, baniſhment, and ſometimes capitally.

ABIHU, brother to Nadab, and ſon to Aaron. The two former had the happineſs to aſcend mount Sinai with their father, and there to behold the glory of God: but afterward putting ſtrange fire into their cenſers, inſtead of the ſacred fire commanded by God, fire ruſhing upon them killed them. Though all the people bewailed this terrible cataſtrophe, Moſes forbad Aaron and his two ſons Eleazer and Ithamar to join in the lamentation.

ABII SCYTHÆ, taken by Strabo to denote the European

* Eccl. Hiſt. lib. i. c. 13.

ropean Sarmatæ, bordering on the Thracians and Baſtanæ: They were commended by Curtius for their love of juſtice, and by Ammieſius for their contempt of earthly things.

ABIMELECH, king of Gerar, a country of the Philiſtines, was cotemporary with Abraham. This patriarch and his family being there, his wife Sarah, though 90 years of age, was not ſafe in it; for Abimelech carried her off, and was ſo enamoured of her, that he reſolved to marry her. Abraham did not declare himſelf Sarah's huſband; but gave out ſhe was his ſiſter. But the king being warned in a dream, that ſhe was married to a prophet, and that he ſhould die if he did not reſtore her to Abraham, the king obeyed: at the ſame time reproving Abraham for his diſingenuity; who thereupon, among other excuſes, ſaid ſhe was really his ſiſter, being born of the ſame father, tho' of a different mother. Abimelech afterwards gave conſiderable preſents to Abraham; and a covenant, that of Beerſheba, was entered into between them.—After the death of Abraham, there being a famine in the neighbouring countries, Iſaac his ſon alſo withdrew into Gerar, which was then likewiſe governed by a king called—

Abimelech, probably the ſucceſſor of the former. Here Rebekah's beauty forced her huſband to employ Abraham's artifice. Abimelech diſcovering that they were nearly related, chid Iſaac for calling his wife his ſiſter; and at the ſame time forbad all his ſubjects, upon pain of death, to do the leaſt injury to Iſaac or Rebekah.—Iſaac's proſperity loſt him the king's friendſhip, and he was deſired to go from among them. He obeyed; but Abimelech afterwards entered into a covenant with him.

Abimelech, the natural ſon of Gideon, by Druma his concubine. His violent acts and death are recorded in Judges, chap. ix.

ABINGDON, a market town in Berkſhire, ſeated on a branch of the Thames, received its name from an abbey anciently built there. The ſtreets, which are well paved, centre in a ſpacious area, in which the market is held; and in the centre of this area is the market-houſe, which is ſupported on lofty pillars, with a large hall of free ſtone above, in which the ſummer-aſſizes for the county are held, and other public buſineſs done, the Lent aſſizes being held at Reading. It has two churches, one dedicated to St. Nicholas, and the other to St. Helena: the latter is adorned with a ſpire, and both are ſaid to have been erected by the abbots of Abingdon. Here are alſo two hoſpitals, one for ſix, and the other for thirteen poor men, and as many poor women; a free ſchool; and a charity-ſchool. The town was incorporated by Queen Mary. It ſends two members to Parliament, who are choſen by the inhabitants at large not receiving alms. Its great manufacture is malt, large quantities of which are ſent by water to London. It is ſix miles and a half ſouth of Oxford, 47 eaſt of Glouceſter, and 55 weſt of London. This town is ſuppoſed by Biſhop Gibſon to be the place called, in the Saxon annals, *Cloveſhoo*, where two ſynods are ſaid to have been held, one in 742, and the other in 822. Long. 1. 20. Lat. 51.

ABINTESTATE, in the civil law, is applied to a perſon who inherits the right of one who died inteſtate or without making a will. See Intestate.

ABIPONIANS, a tribe of American Indians, who formerly inhabited the diſtrict of *Chaks* in Paraguay; but the hoſtilities of the Spaniards have now obliged them to remove ſouthward into the territory lying between Santa Fe and St. Jago. The only account we have of them is that publiſhed by M. Dobrizhoffer in 1785. This gentleman, who lived ſeven years in their country, informs us that they are not numerous, the whole nation not much exceeding 5000; for which he aſſigns as a reaſon an unnatural cuſtom among their women of ſometimes deſtroying their own children from motives of jealouſy, leſt their huſbands ſhould take other mates during the long time they give ſuck, which is not leſs than two years. They are naturally white, but, by expoſure to the air and ſmoke, become of a brown colour. They are a ſtrong and hardy race of people; which our author attributes to their marrying ſo late, an Abiponian ſeldom or never thinking of marriage till 30 years of age. They are greatly celebrated on account of their chaſtity and other virtues; though, according to our author, they have no knowledge of a Deity. They make frequent incurſions into the territories of the Spaniards, mounted on the horſes which run wild in thoſe parts. They have a kind of order of chivalry for their warriors; and are ſo formidable, that 100 of their enemies will fly before ten of theſe horſemen. The hatred which theſe ſavages, whoſe manners, though rude and uncultivated, are in many reſpects pure and virtuous, bear to the Spaniards, is invincible. "Theſe pretended Chriſtians," ſays our author, "who are the ſcum of the Spaniſh nation, practiſe every kind of fraud and villany among theſe poor barbarians; and their corrupt and vicious morals are ſo adapted to prejudice the Abiponians againſt the Chriſtian religion, that the Jeſuit miſſionaries have, by a ſevere law, prohibited any Spaniard from coming, without a formal permiſſion, into any of their colonies."—From his account of the ſucceſs of the Jeſuits in converting them to Chriſtianity, however, it does not appear that they have been able to do more than bribe them to a compliance with the ceremonies of the Popiſh ſuperſtition; ſo that in general they are quite ignorant and uncivilized: a moſt ſtriking inſtance of which is, that in counting they can go no farther than three; and all the art of the Jeſuits to teach them the ſimpleſt uſe and expreſſion of numbers, has proved unſucceſsful.

ABIRAM, a ſeditious Levite, who, in concert with Korah and Dathan, rebelled againſt Moſes and Aaron, in order to ſhare with them in the government of the people; when Moſes ordering them to come with their cenſers before the altar of the Lord, the earth ſuddenly opened under their feet, and ſwallowed up them and their tents; and at the ſame inſtant fire came from heaven, and conſumed 250 of their followers. Numb. xvi.

ABISHAI, ſon of Zeruiah, and brother to Joab, was one of the celebrated warriors who flouriſhed in the reign of David: he killed with his own hand 300 men, with no other weapon but his lance; and ſlew a Philiſtine giant, the iron of whoſe ſpear weighed 300 ſhekels. 1 Sam. xxvi. 2 Sam. xxiii.

ABJURATION, in ancient cuſtom, implied an oath, taken by a perſon guilty of felony, and who had fled to a place of ſanctuary, whereby he ſolemnly engaged to leave the kingdom for ever.

Abjuration, is now uſed in Britain to ſignify the renouncing, diſclaiming, and denying upon oath the Pretender to have any kind of right to the crown.

Abjuration of Hereſy, the ſolemn recantation of any doctrine as falſe and wicked.

ABLACTATION, or weaning a child from the breaſt. See Weaning.

Ablactation, among the ancient gardeners, the ſame with what is called *Grafting by approach*.

ABLAI, a country of Great Tartary, the inhabitants of which, called *Buchars*, or *Buchares*, are ſubject to Ruſſia, but that only for protection. It lies eaſtward of the river Irtis, and extends five hundred leagues along the ſouthern frontiers of Siberia.

ABLACQUEATION, an old term in gardening, ſignifies the operations of removing the earth and baring the roots of trees in winter, to expoſe them more freely to the air, rain, ſnows, &c.

ABLANCOURT. See Perrot.

ABLATIVE, in grammar, the ſixth caſe of Latin nouns. The word is formed from *auferre*, "to take away." Priſcian alſo calls it the *comparative caſe*; as ſerving, among the Latins, for comparing, as well as taking away.

The ablative is oppoſite to the dative; the firſt expreſſing the action of taking away, and the latter that of giving.

In Engliſh, French, &c. there is no preciſe mark whereby to diſtinguiſh the ablative from other caſes; and we only uſe the term in analogy to the Latin. Thus, in the two phraſes, *the magnitude of the city*, and *he ſpoke much of the city*; we ſay, that *of the city* in the firſt is *genitive*, and in the latter *ablative*; becauſe it would be ſo, if the two phraſes were expreſſed in Latin.

The queſtion concerning the Greek ablative has been the ſubject of a famous literary war between two great grammarians, Friſchlin and Cruſius; the former of whom maintained, and the latter oppoſed, the reality of it. The diſpute ſtill ſubſiſts among their reſpective followers. The chief reaſon alleged by the former is, that the Roman writers often joined Greek words with the Latin prepoſitions, which govern ablative caſes, as well as with nouns of the ſame caſe. To which their opponents anſwer, that the Latins anciently had no ablative themſelves; but inſtead thereof, made uſe, like the Greeks, of the dative caſe; till at length they formed an ablative, governed by prepoſitions, which were not put before the dative: that, at firſt, the two caſes had always the ſame termination, as they ſtill have in many inſtances: but that this was afterwards changed in certain words. It is no wonder then, that the Latins ſometimes join prepoſitions which govern an ablative caſe, or nouns in the ablative caſe, with Greek datives, ſince they were originally the ſame; and that the Greek dative has the ſame effect as the Latin ablative.

ABLE, or Abel (Thomas), chaplain to queen Catharine, conſort to Henry VIII. diſtinguiſhed himſelf by his zeal in oppoſing the proceedings againſt that unfortunate princeſs for a divorce. For this purpoſe he wrote a piece intitled, "*Tractatus de non diſſolvendo Henrici et Catherinæ matrimonio*, i. e. A Treatiſe proving that the marriage of king Henry and queen Catharine ought not to be diſſolved." But the title of the book, according to biſhop Tanner, was *Invicta Veritas*. He took the degree of Bachelor of Arts at Oxford on the 4th of July 1513, and that of Maſter of Arts on the 27th of July 1516. In 1534, he fell under a proſecution for being concerned in the affair of Elizabeth Barton, called the *Holy Maid of Kent*. This was an infamous impoſtor, ſuborned by the monks to uſe ſome ſtrange geſticulations, and to pretend to inſpiration by the ſpirit of prophecy; and ſo well did ſhe act her part, that ſome people of conſequence gave credit to her: but being at laſt detected, ſhe was condemned and executed, after diſcovering the names of her principal accomplices and inſtigators. On her account Able was accuſed of miſpriſion of treaſon, by ſtat. 25. Hen. VIII.; and being alſo one of thoſe who denied the king's ſupremacy over the church, he was apprehended and impriſoned; during which time his confinement was ſo rigorous, that the keeper of Newgate was committed to Marſhalſea priſon for ſuffering him to go out upon bail. He was afterwards hanged, drawn, and quartered, at Smithfield in 1540. Bouchier gives him the character of a very learned man; and tells us, that he uſed to teach the queen muſic and the learned languages.

ABLECTI, in Roman antiquity, a ſelect body of ſoldiers choſen from among thoſe called Extraordinarii.

ABLEGMINA, in Roman antiquity, thoſe choice parts of the entrails of victims which were offered in ſacrifice to the gods. They were ſprinkled with flour, and burnt upon the altar; the prieſts pouring ſome wine on them.

ABLUENTS, in medicine, the ſame with diluters or Diluents.

ABLUTION, in a general ſenſe, ſignifies the waſhing or purifying ſomething with water.

Ablution, in a religious ſenſe, a ceremony in uſe among the ancients, and ſtill practiſed in ſeveral parts of the world: it conſiſted in waſhing the body, which was always done before ſacrificing, or even entering their houſes.—Ablutions appear to be as old as any ceremonies, and external worſhip itſelf. Moſes enjoined them; the heathens adopted them; and Mahomet and his followers have continued them: thus they have got footing among moſt nations, and make a conſiderable part of moſt eſtabliſhed religions. The Egyptian prieſts had their diurnal and nocturnal ablutions: the Grecians their ſprinklings; the Romans their luſtrations and lavations; the Jews their waſhing of hands and feet, beſide their baptiſms. The ancient Chriſtians had their ablutions before communion; which the Romiſh church ſtill retain before their maſs, ſometimes after: the Syrians, Copts, &c. have their ſolemn waſhings on Good Friday: the Turks their greater and leſſer ablutions; their Ghaſt and Wodou, their Aman, Taharat, &c.

ABNER, the ſon of Ner, father-in-law to Saul, and general of all his forces, who ſerved him on all occaſions with fidelity and courage. After the death of that prince, Abner ſet Iſhboſheth, Saul's ſon, on the throne. A war breaking out between the tribe of Judah who had elected David king, and Iſrael, Abner marched againſt that prince with the flower of his troops, but was defeated. Abner afterward, being diſguiſed, went over to David, and diſpoſed the chiefs of the army and the elders of Iſrael to declare for him; and was received by David with ſuch teſtimonies of affection, as gave umbrage to Joab, who killed him traiterouſly.

ABNOBA, now ABENOW, a long range of mountains in Germany, taking different names according to the different countries they run through. As about the river Maine, called the *Oden* or *Ottenwald;* between Heſſe and Franconia, the *Speſſart;* and about the duchy of Wirtemberg, where the Danube takes its riſe, called the *Baar*.

ABO, a maritime town in Sweden: it is the capital of the province of Finland, and lies upon the point where the gulphs of Bothnia and Finland unite. It is a good port; and is the ſee of a biſhop, ſuffragan of Upſal. It has an univerſity, founded by queen Chriſtina in 1640, and endowed with the ſame privileges as that of *Upſal*. There is alſo a ſchool here, which was founded by Guſtavus Adolphus, for 300 ſcholars. The town is tolerably well built, and contains ſeveral brick buildings; but the generality are of wood painted red. The inhabitants export linen, corn, and planks. It lies 120 miles north-eaſt from Stockholm. E. Long. 21. 28. Lat. 60. 50.

ABOARD, the inſide of a ſhip. Hence any perſon who enters a ſhip is ſaid to *go aboard:* but when an enemy enters in the time of battle, he is ſaid to *board;* a phraſe which always implies hoſtility.—To *fall aboard of*, is to ſtrike or *encounter* another ſhip when one or both are in motion, or to be driven upon a ſhip by the force of the wind and current.—*Aboard-main-tack*, the order to draw the main-tack, *i. e.* the lower corner of the main-ſail, down to the CHESS-TREE.

ABOLITION, implies the act of annulling, deſtroying, making void, or reducing to nothing. In law, it ſignifies the repealing any law or ſtatute.

ABOLLA, a warm kind of garment, lined or doubled, worn by the Greeks and Romans, chiefly out of the city, in following the camp.—Critics and antiquaries are greatly divided as to the form, uſe, kinds, &c. of this garment. Papias makes it a ſpecies of the toga, or gown; but Nonius, and the generality, a ſpecies of the pallium, or cloak. The *abolla* ſeems rather to have ſtood oppoſed to the *toga*, which was a garment of peace, as the *abolla* was of war; at leaſt Varro and Martial place them in this oppoſite light. There ſeem to have been different kinds of abollas, ſuited to different occaſions. Even kings appear to have uſed the abolla: Caligula was affronted at king Ptolemy for appearing at the ſhews in a purple abolla, and by the eclat thereof turning the eyes of the ſpectators from the emperor upon himſelf.

ABOMASUS, ABOMASUM, or ABOMASIUS, names of the fourth ſtomach of ruminating animals. It is in the abomaſus of calves and lambs that the runnet or earning is formed wherewith milk is curdled. See COMPARATIVE *Anatomy*.

ABOMINATION, a term uſed in ſcripture with regard to the Hebrews, who, being ſhepherds, are ſaid to have been an abomination to the Egyptians, becauſe they ſacrificed the ſacred animals of that people, as oxen, goats, ſheep, &c. which the Egyptians eſteemed as abominations, or things unlawful. The term is alſo applied in the ſacred writings to idolatry and idols, becauſe the worſhip of idols is in itſelf an abominable thing, and at the ſame time ceremonies obſerved by idolaters were always attended with licentiouſneſs and other odious and abominable actions. The *abomination of deſolation*, foretold by the prophet Daniel, is ſuppoſed to imply the ſtatue of Jupiter Olympius, which Antiochus Epiphanes cauſed to be placed in the temple of Jeruſalem. And the *abomination of deſolation*, mentioned by the Evangeliſts, ſignifies the enſigns of the Romans, during the laſt ſiege of Jeruſalem by Titus, on which the figures of their gods and emperors were embroidered, and placed upon the temple after it was taken.

ABON, ABONA, or ABONIS (anc. geog.), a town and river of Albion. The town, according to Camden, is Abingdon; and the river Abhon or Avon. But by Antonine's Itinerary, the diſtance is nine miles from the Venta Silurum, or Caer-Went: others, therefore, take the town to be Porſhut, at the mouth of the river Avon, over againſt Briſtol. Abhon or Avon, in the Celtic language, denotes a river.

ABORIGINES, (Dionyſius of Halicarnaſſus, Livy, Virgil); originally a proper name, given to a certain people in Italy, who inhabited the ancient Latium, or country now called *Campagna di Roma*. In this ſenſe the Aborigines are diſtinguiſhed from the Janigenæ, who, according to the falſe Beroſus, inhabited the country before them; from the Siculi, whom they expelled; from the Grecians, from whom they deſcended; from the Latins, whoſe name they aſſumed after their union with Æneas and the Trojans; laſtly, from the Auſonii, Volſci, Oenotrii, &c. neighbouring nations in other parts of the country. Whence this people came by the appellation, is much diſputed. St Jerome ſays, they were ſo called, as being, *abſque origine*, the primitive planters of the country after the flood: Dion. of Halicarnaſſus accounts for the name, as denoting them the founders of the race of inhabitants of that country: others think them ſo called, as being originally Arcadians, who claimed to be earth-born, and not deſcended from any people. Aurelius Victor ſuggeſts another opinion, viz. that they were called *Aborigines*, q. d. *Aberrigines*, from *ab* "from" and *errare* "to wander;" as having been before a wandering people. Pauſanias rather thinks they were thus called απο ορεσι, from "mountains;" which opinion ſeems confirmed by Virgil, who, ſpeaking of Saturn, the legiſlator of this people, ſays,

Is genus indocile ac diſperſum montibus altis
Compoſuit, legeſque dedit.——

The Aborigines were either the original inhabitants of the country, ſettled there by Janus, as ſome imagine; or by Saturn, or Cham, as others; not long after the diſperſion, or even, as ſome think, before it: Or they were a colony ſent from ſome other nation; who expelling the ancient inhabitants the Siculi, ſettled in their place.—About this mother-nation there is great diſpute. Some maintain it to be the Arcadians, parties of whom were brought into Italy at different times; the firſt under the conduct of Oenotrius, ſon of Lycaon, 450 years before the Trojan war; a ſecond from Theſſaly; a third under Evander, 60 years before the Trojan war: beſides another under Hercules; and another of Lacedæmonians, who fled from the ſevere diſcipline of Lycurgus: all theſe uniting, are ſaid to have formed the nation or kingdom of the Aborigines. Others will have them of barbarous rather than Grecian origin, and to have come from Scythia; others from Gaul. Laſtly, others will have them to be Canaanites, expelled by Joſhua.

The term *Aborigines*, though ſo famous in antiquity, is uſed in modern geography only occaſionally as an appellative. It is given to the primitive inhabitants of a country, in contradiſtinction to colonies, or new races of people.

ABORTION, in midwifery, the excluſion of a fœtus before it has acquired a ſufficient degree of perfection to enable it to perform reſpiration and the other vital functions. See MIDWIFERY.

The practice of procuring abortions was prohibited by the ancient Greek legiſlators Solon and Lycurgus. Whether or not it was permitted among the Romans, has been much diſputed. It is certain the practice, which was by them called *viſceribus vim inferre*, was frequent enough: but whether there was any penalty on it, before the emperors Severus and Antonine, is the queſtion. Noodt maintains the negative; and further, that thoſe princes only made it criminal in one particular caſe, viz. of a married woman's practiſing it out of reſentment againſt her huſband, in order to defraud him of the comfort of children: this was ordered to be puniſhed by a temporary exile. The foundation on which the practice is ſaid to have been allowed, was, that the fœtus, while *in utero*, was reputed as a part of the mother, ranked as one of her own viſcera, over which ſhe had the ſame power as over the reſt: beſides, that it was not reputed as a man, *homo*; nor to be alive, otherwiſe than as a vegetable: conſequently, that the crime amounted to little more than that of plucking unripe fruit from the tree. Seneca repreſents it as a peculiar glory of Helvia, that ſhe had never, like other women, whoſe chief ſtudy is their beauty and ſhape, deſtroyed the fœtus in her womb. The primitive fathers, Athenagoras, Tertullian, Minutius Felix, Auguſtin, &c. declaimed loudly againſt the practice as virtual murder. Several councils have condemned it. Yet we are told that the modern Romiſh eccleſiaſtical laws allow of diſpenſations for it. Egane mentions the rates at which a diſpenſation for it may be had.

The practice of artificial abortion is chiefly in the hands of women and nurſes, rarely in that of phyſicians; who, in ſome countries, are not admitted to the profeſſion without abjuring it. Hippocrates, in the oath he would have enjoined on all phyſicians, includes their not giving the *peſſus abortivus*; though elſewhere he gives the formal proceſs whereby he himſelf procured in a young woman a miſcarriage. It may, however, be obſerved, that often all the powers of art prove ineffectual, and no leſs often do the attempts prove the means of puniſhment by the fatal conſequences which they produce.

ABORTION, among gardeners, ſignifies ſuch fruits as are produced too early, and never arrive at maturity.

ABORTIVE, is, in general, applied to whatever comes before its legitimate time, or to any deſign which miſcarries.

ABORTIVE Corn, a diſtemper of corn mentioned by M. Gillet, and ſuſpected to be occaſioned by inſects. It appears long before harveſt, and may be known by a deformity of the ſtalk, the leaves, the ear, and even the grain.

ABORTIVE Vellum is made of the ſkin of an abortive calf.

ABOUKIR, a ſmall town of Egypt, ſituate in the deſart between Alexandria and Roſetta. It is the ancient Canopus, and is ſituated, according to Mr Savary, ſix leagues from Pharos. Pliny ſays, from the teſtimonies of antiquity, that it was formerly an iſland: and its local appearance makes this credible; for the grounds around it are ſo low, that the ſea ſtill covered a part of them in the days of Strabo. The town is built upon a rock, which forms a handſome road for ſhipping, and is out of the reach of inundations.—See CANOPUS.

ABOUT, the ſituation of a ſhip immediately after ſhe has *tacked*, or changed her courſe by going about and ſtanding on the other tack.—*About ſhip!* the order to the ſhip's crew to prepare for tacking.

ABOUTIGE, a town in Upper Egypt, in Africa, near the Nile, where they make the beſt opium in all the Levant. It was formerly a large, but now is a mean place. N. Lat. 26. 50.

ABRA, a ſilver coin ſtruck in Poland, and worth about one ſhilling ſterling. It is current in ſeveral parts of Germany, Conſtantinople, Aſtracan, Smyrna, and Grand Cairo.

ABRABANEL, ABARBANEL, or AVRAVANEL, (Iſaac), a celebrated rabbi, deſcended from king David, and born at Liſbon A. D. 1437. He became counſellor to Alphonſo V. king of Portugal, and afterwards to Ferdinand the Catholic; but in 1492 was obliged to leave Spain with the other Jews. In ſhort, after reſiding at Naples, Corfu, and ſeveral other cities, he died at Venice in 1508, aged 71. Abrabanel paſſed for one of the moſt learned of the rabbis; and the Jews gave him the names of the Sage, the Prince, and the Great Politician. We have a commentary of his on all the Old Teſtament, which is pretty ſcarce: he there principally adheres to the literal ſenſe; and his ſtyle is clear, but a little diffuſe. His other works are, A Treatiſe on the Creation of the World; in which he refutes Ariſtotle, who imagined that the world was eternal: A Treatiſe on the explication of the prophecies relating to the Meſſiah, againſt the Chriſtians: A book concerning articles of Faith; and ſome others leſs ſought after. Though Abrabanel diſcovers his implacable averſion to Chriſtianity in all his writings, yet he treated Chriſtians with politeneſs and good-manners in the common affairs of life.

ABRACADABRA, a magical word, recommended by Serenus Samonicus as an antidote againſt agues and ſeveral other diſeaſes. It was to be written upon a piece of paper as many times as the word contained letters, omitting the laſt letter of the former every time, as in the margin †, and repeated in the ſame order; and then ſuſpended about the neck by a linen thread. *Abracadabra* was the name of a god worſhiped by the Syrians; ſo wearing his name was a ſort of invocation of his aid; a practice which, though not more uſeful, yet was leſs irrational, than is the equally heatheniſh practice among thoſe who call themſelves Chriſtians, of wearing various things, in expectation of their operating by a Sympathy, whoſe parents were Ignorance and Superſtition.

†
abracadabra
abracadabr
abracadab
abracada
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ABRAHAM, the father and ſtock whence the faithful ſprung, was the ſon of Terah. He was deſcended from Noah by Shem, from whom he was nine degrees removed. Some fix his birth in the 130th year of Terah's age, but others place it in his father's 70th year. It is highly probable he was born in the city of Ur, in Chaldee, which he and his father left when they went to Canaan, where they remained till the death of Terah; after which, Abraham reſumed his firſt deſign of going to Paleſtine. The Scriptures mention the ſeveral places he ſtopped at in Canaan; his journey into Egypt, where his wife was carried off from him; his going into Gerar, where Sarah was again taken from him, but reſtored as before; the victory he obtained over the four kings who had plundered Sodom; his compliance with his wife, who inſiſted that he ſhould make uſe of their maid Hagar in order to raiſe up children; the covenant God made with him, ſealed with the ceremony of circumciſion; his obedience to the command of God, who ordered him to offer up his only ſon as a ſacrifice, and how this bloody act was prevented; his marriage with Keturah; his death at the age of 175 years; and his interment at the cave of Macpelah, near the body of Sarah his firſt wife. It would be of little uſe to dwell long upon theſe particulars, ſince they are ſo well known. But tradition has ſupplied numberleſs others, the mention of one or two of which may not be unacceptable.

Many extraordinary particulars have been told relating to his converſion from idolatry. It is a pretty general opinion, that he ſucked in the poiſon with his milk; that his father made ſtatues, and taught that they were to be worſhipped as gods.* Some Jewiſh authors relate,† that Abraham followed the ſame trade with Terah for a conſiderable time. Maimonides‡ ſays, that he was bred up in the religion of the Sabæans, who acknowledged no deity but the ſtars; that his reflections on the nature of the planets, his admiration of their motions, beauty, and order, made him conclude there muſt be a being ſuperior to the machine of the univerſe, a being who created and governed it: however, according to an old tradition, he did not renounce paganiſm till the 50th year of his age. It is related, § that his father, being gone a journey, left him to ſell the ſtatues in his abſence; and that a man, who pretended to be a purchaſer, aſked him how old he was. Abraham anſwered, "Fifty."—"Wretch that thou art (ſaid the other), for adoring, at ſuch an age, a being which is but a day old!" Theſe words greatly confounded Abraham. Some time afterwards, a woman brought him ſome flour, that he might give it as an offering to the idols; but Abraham, inſtead of doing ſo, took up a hatchet and broke them all to pieces, excepting the largeſt, into the hand of which he put the weapon. Terah, at his return, aſked whence came all this havock? Abraham made anſwer, that the ſtatues had had a great conteſt which ſhould eat firſt of the oblation: "Upon which (ſaid he), the god you ſee there, being the ſtouteſt, hewed the others to pieces with that hatchet." Terah told him this was bantering; for thoſe idols had not the ſenſe to act in this manner. Abraham retorted theſe words upon his father, againſt the worſhipping of ſuch gods. Terah, ſtung with his raillery, delivered up his ſon to the cogniſance of Nimrod, the ſovereign of the country: who exhorted Abraham to worſhip the fire; and, upon his refuſal, commanded him to be thrown into the midſt of the flames: "Now let your God (ſaid he) come and deliver you:" But (adds the tradition), Abraham came ſafe and ſound out of the flames.—This tradition is not of modern date, ſince it is told by St. Jerome; || who ſeems to credit it in general, but diſbelieves that part of it which makes Terah ſo cruel as to be the informer againſt his own ſon. Perhaps the ambiguity of the word *Ur** might have given riſe to this fiction altogether. Such as lay ſtreſs on the following words which God ſays to Abraham (Gen. xv. 7.), *I am the Lord that brought thee out of Ur of the Chaldees,* imagine that he ſaved him from a great perſecution, ſince he employed the very ſame words in the beginning of the decalogue, to denote the deliverance from Egypt.

Abraham is ſaid to have been well ſkilled in many ſciences, and to have wrote ſeveral books. Joſephus† tells us that he taught the Egyptians arithmetic and geometry; and, according to Eupolemus and Artapan, he inſtructed the Phœnicians, as well as the Egyptians, in aſtronomy. A work which treats of the creation has been long aſcribed to him; it is mentioned in the Talmud,‡ and the Rabbis Chanina and Hoſchia uſed to read it on the eve before the ſabbath. In the firſt ages of Chriſtianity, according to St. Epiphanius, || a heretical ſect, called Sethinians, diſperſed a piece which had the title of *Abraham's Revelation.* Origen mentions alſo a treatiſe ſuppoſed to be wrote by this patriarch. All the ſeveral works which Abraham compoſed in the plains of Mamre, are ſaid to be contained in the library of the monaſtery of the Holy Croſs on Mount Amaria, in Ethiopia. § The book on the creation was printed at Paris 1552, and tranſlated into Latin by Poſtel: Rittangel, a converted Jew, and profeſſor at Konigſberg, gave alſo a Latin tranſlation of it, with remarks, in 1642.

ABRAHAM USQUE, a Portugueſe Jew, who tranſlated the Bible out of Hebrew into Spaniſh. It was printed at Ferrara in 1553, and reprinted in Holland in 1630. This Bible, eſpecially the firſt edition, which is moſt valuable, is marked with ſtars at certain words, which are deſigned to ſhow that theſe words are difficult to be underſtood in the Hebrew, and that they may be uſed in a different ſenſe.

ABRAHAM (Nicholas), a learned Jeſuit born in the dioceſe of Toul, in Lorrain, in 1589. He obtained the rank of divinity-profeſſor in the univerſity of Pont-a-Mouſon, which he enjoyed 17 years, and died September 7, 1655. He wrote Notes on Virgil and on Nonnius; A Commentary on ſome of Cicero's Orations, in 2 vols. folio; An excellent collection of theological pieces, in folio, intitled *Pharus Veteris Teſtamenti;* and ſome other works.

ABRAHAMITES, an order of monks exterminated for idolatry by Theophilus in the ninth century. Alſo the name of another ſect of heretics who had adopted the errors of Paulus. See PAULICIANS.

ABRANTES, a town of Portugal, in Eſtremadura, ſeated on the river Tajo, belongs to a marquis of the ſame name. It ſtands high; is ſurrounded with gardens and olive-trees, and contains thirty-five thouſand inhabitants. It has four convents, an alms-houſe, and an hoſpital. W. Long. 7. 18. Lat. 39. 13.

ABRASAX, or ABRAXAS, the ſupreme god of the Baſilidian heretics. It is a myſtical word, compoſed of the Greek numerals, α, ϐ, ρ, α, ξ, α, ς, which together make up the number CCCLXV. For Baſilides taught, that there were 365 heavens between the earth and the empyrean; each of which heavens had its angel or intelligence, which created it; each of which angels like-

* Suidas, in Εαρȣχ. See Joſhua xxiv. 2.

† Apud Genebrand. in Chron.

‡ More Nevoch. c. 29.

§ Heidegg. Hiſt. Patriarch. tom. iii. p. 36.

§ Tradit. Hebraic. in Geneſin.

* It is the proper name of a city, and it alſo ſignified *fire.* The Latin verſion, Eſd. ix. has it thus: *Qui elegiſti eum de igne Chaldeorum.*

† Antiq. lib. i. cap. 7, 8.

‡ Heidegg. Hiſt. Patriarch. tom. ii. p. 143.

|| Adverſ. Hær. p. 216

§ Kirchem, treatiſe of libraries, p. 142.

wiſe was created by the angel next above it; thus aſcending by a ſcale to the ſupreme Being, or firſt Creator. The Baſilidians uſed the word *Abraxas* by way of charm or amulet.

ABRASION, is ſometimes uſed, among medicinal writers, for the effect of ſharp corroſive medicines or humours in wearing away the natural mucus which covers the membranes, and particularly thoſe of the ſtomach and inteſtines. The word is compoſed of the Latin *ab* and *rado,* to *ſhave* or *ſcrape off.*

ABRAVANNUS (anc. geog.), the name of a promontory and river of Galloway, in Scotland, ſo called from the Celtic terms *Aber,* ſignifying either the mouth of a river, or the confluence of two rivers, and *Avon,* a river.

ABRAUM, in natural hiſtory, a name given by ſome writers to a ſpecies of red clay, uſed in England by the cabinet makers, &c to give a red colour to new mahogany wood. We have it from the iſle of Wight; but it is alſo found in Germany and Italy.

ABRAXAS, an antique ſtone with the word *abraxas* engraven on it. They are of various ſizes, and moſt of them as old as the third century. They are frequent in the cabinets of the curious; and a collection of them, as complete as poſſible, has been deſired by ſeveral. There is a fine one in the abbey of St Geneviéve, which has occaſioned much ſpeculation. Moſt of them ſeem to have come from Egypt; whence they are of ſome uſe for explaining the antiquities of that country. Sometimes they have no other inſcription beſides the word: but others have the names of ſaints, angels, or Jehovah himſelf annexed; though moſt uſually the name of the Baſilidian god. Sometimes there is a repreſentation of Iſis ſitting on a lobes, or apis, ſurrounded with ſtars; ſometimes monſtrous compoſitions of animals, obſcene images, Phalli and Ithyfalli. The graving is rarely good, but the word on the reverſe is ſometimes ſaid to be in a more modern taſte than the other. The characters are uſually Greek, Hebrew, Coptic, or Hetnerian, and ſometimes of a mongrel kind, invented, as it would ſeem, to render their meaning the more inſcrutable. It is diſputed whether the Veronica of Montreuil, or the granite obeliſk mentioned by Gori, be *Abraxaſes.*

ABREAST (a ſea-term), ſide by ſide, or oppoſite to; a ſituation in which two or more ſhips lie, with their ſides parallel to each other, and their heads equally advanced. This term more particularly regards the line of battle at ſea, where, on the different occaſions of attack, retreat, or purſuit, the ſeveral ſquadrons or diviſions of a fleet are obliged to vary their diſpoſitions, and yet maintain a proper regularity by ſailing in right or curved lines. When the line is formed *abreaſt,* the whole ſquadron advances uniformly, the ſhips being equally diſtant from and parallel to each other, ſo that the length of each ſhip forms a right angle with the extent of the ſquadron or line abreaſt. The commander in chief is always ſtationed in the centre, and the ſecond and third in command in the centres of their reſpective ſquadrons.—*Abreaſt,* within the ſhip, implies on a line with the beam, or by the ſide of any object abroad; as, the frigate ſprung a leak *abreaſt* of the main hatch-way, *i. e.* on the ſame line with the main hatch-way, croſſing the ſhip's length at right angles, in oppoſition to AFORE or ABAFT the hatch-way.—We diſcovered a fleet *abreaſt* of Beachy-head; *i. e.* off, or directly oppoſite to it.

ABRETTENE, or ABRETTINE (anc. geog.), a diſtrict of Myſia, in Aſia. Hence the epithet *Abrettenus* given Jupiter, (Strabo); whoſe prieſt was Cleon, formerly at the head of a gang of robbers, and who received many and great favours at the hand of Antony, but afterwards went over to Auguſtus. The people were called *Abretteni;* inhabiting the country between Ancyra of Phrygia and the river Rhyndacus.

ABRIDGEMENT, in literature, a term ſignifying the reduction of a book into a ſmaller compaſs.

The art of conveying much ſentiment in few words, is the happieſt talent an author can be poſſeſſed of. This talent is peculiarly neceſſary in the preſent ſtate of literature; for many writers have acquired the dexterity of ſpreading a few tritical thoughts over ſeveral hundred pages. When an author hits upon a thought that pleaſes him, he is apt to dwell upon it, to view it in different lights, to force it in improperly, or upon the ſlighteſt relations. Though this may be pleaſant to the writers, it tires and vexes the reader. There is another great ſource of diffuſion in compoſition. It is a capital object with an author, whatever be the ſubject, to give vent to all his beſt thoughts. When he finds a proper place for any of them, he is peculiarly happy. But, rather than ſacrifice a thought he is fond of, he forces it in by way of digreſſion, or ſuperfluous illuſtration. If none of theſe expedients anſwer his purpoſe, he has recourſe to the margin, a very convenient apartment for all manner of pedantry and impertinence. There is not an author, however correct, but is more or leſs faulty in this reſpect. An abridger, however, is not ſubject to theſe temptations. The thoughts are not his own; he views them in a cooler and leſs affectionate manner; he diſcovers an impropriety in ſome, a vanity in others, and a want of utility in many. His buſineſs, therefore, is to retrench ſuperfluities, digreſſions, quotations, pedantry, &c. and to lay before the public only what is really uſeful. This is by no means an eaſy employment: To abridge ſome books, requires talents equal, if not ſuperior, to thoſe of the author. The facts, manner, ſpirit, and reaſoning, muſt be preſerved; nothing eſſential, either in argument or illuſtration, ought to be omitted. The difficulty of the taſk is the principal reaſon why we have ſo few good abridgments: Wynne's abridgement of Locke's Eſſay on the Human Underſtanding, is, perhaps, the only unexceptionable one in our language.

Theſe obſervations relate ſolely to ſuch abridgements as are deſigned for the public. But,

When a perſon wants to ſet down the ſubſtance of any book, a ſhorter and leſs laborious method may be followed. It would be foreign to our plan to give examples of abridgements for the public: But as it may be uſeful, eſpecially to young people, to know how to abridge books for their own uſe, after giving a few directions, we ſhall exhibit an example or two, to ſhew with what eaſe it may be done.

Read the book carefully; endeavour to learn the principal view of the author; attend to the arguments employed: When you have done ſo, you will generally find, that what the author uſes as new or additional arguments, are in reality only collateral ones, or extenſions of the principal argument. Take a piece of paper or a common-place book, put down what the author wants to prove, ſubjoin the argument or arguments, and you have the ſubſtance of the book in a few lines. For example,

In the Eſſay on Miracles, Mr Hume's deſign is to prove, That miracles which have not been the immediate object of our ſenſes, cannot reaſonably be believed upon the teſtimony of others.

Now, his argument (for there happens to be but one) is,

> “That experience, which in ſome things is variable, in others uniform, is our *only* guide in reaſoning concerning matters of fact. A variable experience gives riſe to probability only; an uniform experience amounts to a proof. Our belief of any fact from the teſtimony of eye-witneſſes is derived from no other principle than our experience in the veracity of human teſtimony. If the fact atteſted be miraculous, here ariſes a conteſt of two oppoſite experiences, or proof againſt proof. Now, a miracle is a violation of the laws of nature; and as a firm and unalterable experience has eſtabliſhed theſe laws, the proof againſt a miracle, from the very nature of the fact, is as complete as any argument from experience can poſſibly be imagined; and if ſo, it is an undeniable conſequence, that it cannot be ſurmounted by any proof whatever derived from human teſtimony.”

In Dr Campbell's Diſſertation on Miracles, the author's principal aim is to ſhew the fallacy of Mr Hume's argument; which he has done moſt ſucceſsfully by another ſingle argument, as follows:

> “The evidence ariſing from human teſtimony *is not ſolely* derived from experience: on the contrary, teſtimony hath a natural influence on belief antecedent to experience. The early and unlimited aſſent given to teſtimony by children gradually contracts as they advance in life: it is, therefore, more conſonant to truth, to ſay, that our *diffidence* in teſtimony is the reſult of experience, than that our *faith* in it has this foundation. Beſides, the uniformity of experience, in favour of any fact, is not a proof againſt its being reverſed in a particular inſtance. The evidence ariſing from the ſingle teſtimony of a man of known veracity will go farther to eſtabliſh a belief in its being actually reverſed: If his teſtimony be confirmed by a few others of the ſame character, we cannot withhold our aſſent to the truth of it. Now, tho' the operations of nature are governed by uniform laws, and though we have not the teſtimony of our ſenſes in favour of any *violation* of them; ſtill, if in particular inſtances we have the teſtimony of *thouſands* of our fellow-creatures, and thoſe too, men of ſtrict integrity, ſwayed by no motives of ambition or intereſt, and governed by the principles of common-ſenſe, That they were actually eye-witneſſes of theſe violations, the conſtitution of our nature obliges us to believe them.”

Theſe two examples contain the ſubſtance of about 400 pages.——Making private abridgments of this kind has many advantages; it engages us to read with accuracy and attention; it fixes the ſubject in our minds; and, if we ſhould happen to forget, inſtead of reading the book again, by glancing a few lines we are not only in poſſeſſion of the chief arguments, but recal in a good meaſure the author's method and manner.

Abridging is peculiarly uſeful in taking the ſubſtance of what is delivered by profeſſors, &c. It is impoſſible, even with the aſſiſtance of ſhort-hand, to take down, *verbatim*, what is ſaid by a public ſpeaker. Beſides, although it were practicable, ſuch a talent would be of little uſe. Every public ſpeaker has circumlocutions, redundancies, lumber which deſerve not to be copied. All that is really uſeful may be comprehended in a ſhort compaſs. If the plan of the diſcourſe, and arguments employed in ſupport of the different branches, be taken down, you have the whole. Theſe you may afterwards extend in the form of a diſcourſe dreſſed in your own language. This would not only be a more rational employment, but would likewiſe be an excellent method of improving young men in compoſition; an object too little attended to in all ſeminaries of learning.

ABRINCATARUM OPPIDUM (anc. geog.), the town of the *Abrincatæ* or *Abrincatui*, now *Avranches*, in France, ſituated on an eminence in the ſouth-weſt of Normandy near the borders of Brittany on the Engliſh channel. W. Long. 1. 10. N. Lat. 48. 40.

ABROGATION, the act of aboliſhing a law, by authority of the maker; in which ſenſe the word is ſynonymous with abolition, repealing, and revocation.

Abrogation ſtands oppoſed to *rogation:* it is diſtinguiſhed from *derogation*, which implies the taking away only ſome part of a law; from *ſubrogation*, which denotes the adding a clauſe to it; from *obrogation*, which implies the limiting or reſtraining it; from *diſpenſation*, which only ſets it aſide in a particular inſtance; and from *antiquation*, which is the refuſing to paſs a law.

ABROKANI, or MALLEMOLLI, a kind of muſlin, or clear white fine cotton cloth, brought from the Eaſt Indies, particularly from Bengal; being in length 16 French ells and 3 quarters, and in breadth 5 eighths.

ABROLKOS, the name of certain ſhelves, or banks of ſand, about 20 leagues from the coaſt of Brazil.

ABROTANUM, in botany. See ARTEMISIA and SANTOLINA.

ABROTONUM (anc. geog.), a town and harbour on the Mediterranean, in the diſtrict of Syrtis Parva, in Africa, one of the three cities that went to form Tripoly.

ABRUS, in botany, the trivial name of the GLYCINE.

ABRUZZO, a province in Naples. The river Peſcara divides it into two parts; one of which is called Ulterior, whereof Aquila is the capital; and the other Citerior, whoſe capital is Soromona. Beſides the Appenines, there are two conſiderable mountains, the one called Monte Cavallo, and the other Monte Maiello; the top of which laſt is always covered with ſnow. Abruzzo is a cold country; but the rigour of the climate is not ſo great as to prevent the country from producing in abundance every thing requiſite for the ſupport of life. Vegetables, fruits, animals, and numberleſs other articles of ſuſtenance, not only furniſh ample proviſions for the uſe of the natives, but alſo allow of exportation. There is ſo large a quantity of wheat reaped, that many thouſands of quarters are annually ſhipped off. Much Turkey wheat is ſent out, and the province of Teramo ſells a great deal of rice little inferior in goodneſs to that of Lombardy. Oil is a plentiful commodity, and wines are made for exportation on many parts of the coaſt; but wool has always been, Abruzzo.

and ſtill is their ſtaple commodity: the flocks, after paſſing the whole ſummer in the fine paſtures of the mountains, are driven for the winter into the warm plains of Puglia, and a few ſpots near their own coaſt, where the ſnow does not lie; there are no manufactures of woollens in the province, except two ſmall ones of coarſe cloth, and the greateſt part of the wool is ſent out unwrought. No ſilk is made here, though mulberry-trees would grow well in the low grounds.

Formerly the territory of Aquila furniſhed Italy almoſt excluſively with ſafron; but ſince the culture of that plant has been ſo much followed in Lombardy, it has fallen to nothing in Abruzzo. In the maritime tracks of the country the cultivation of liquorice has been increaſed of late years, but foreigners export the roots in their natural ſtate: in the province of Teramo there is a manufactory of pottery-ware, for which there is a great demand in Germany, by the way of Trieſte, as it is remarkably hard and fine; but even this is going to decay, by being abandoned entirely to the ignorance of common workmen. It is not to be expected that any improvements will be made in arts and manufactures, where the encouragement and attention of ſuperiors is wanting, and no pains taken to render the commodity more marketable, or to open better channels of ſale for it. The only advantages theſe provinces enjoy, are the gift of benevolent nature: but ſhe has ſtill greater preſents in ſtore for them, and waits only for the helping hand of government to produce them. This whole coaſt, one hundred miles in length, is utterly deſtitute of ſea-ports; and the only ſpots where the produce can be embarked are dangerous inconvenient roads, at the mouths of rivers, and along a lee-ſhore: the difficulty of procuring ſhipping, and of loading the goods, frequently cauſes great quantities of them to rot on hand; which damps induſtry, and prevents all improvements in agriculture. The huſbandman is a poor diſpirited wretch, and wretchedneſs produces emigration: the uneven ſurface of the country occaſions it to be inhabited by retail, if the expreſſion may be uſed, rather than in large maſſes; for there is not a city that contains ten thouſand people, and the moſt of them would find it difficult to muſter three thouſand. Villages, caſtles, and feudatory eſtates, are to be met with in abundance; but the numbers of their inhabitants are to be reckoned by hundreds, not thouſands: in a word, the political and ſocial ſyſtem of the province ſhews no ſigns of the vigour which nature ſo remarkably diſplays here in all her operations.

The antiquary and the naturaliſt may travel here with exquiſite pleaſure and profit; the former will find treaſures of inſcriptions, and inedited monuments appertaining to the warlike nations that once covered the face of the country: the natural philoſopher will have a noble field for obſervation in the ſtupendous monuments that ariſe on all ſides. Monte-corno and Majella are among the moſt intereſting; the firſt is like an aged monument of nature, bald, and horribly broken on every aſpect: from various appearances, it is evident that its bowels contain many valuable veins of metallic ore; but the great difficulty of acceſs renders the ſearch of them almoſt impracticable. Majella has other merits, and of a gayer kind:—nature has clothed its declivities and elevated fields with an infinite variety of her moſt precious plants; vulnerary herbs grow there in as great perfection as on the Alps of Swiſſerland, and are applied by the natives to wounds with equal ſucceſs.

Abruzzo
||
Abſinthiated.

The character of the inhabitants varies a little among themſelves, according to ſituation and climate, but eſſentially from the diſpoſition of the natives of the more ſouthern provinces. This proceeds from a difference of origin: for the Lombards, who were barbarians, but not cruel; poor, but hoſpitable; endowed with plain honeſt ſenſe, though poſſeſſed of little acuteneſs or ſubtlety; remained peaceable proprietors, of theſe mountainous regions, till the Normans, who were accuſtomed to a ſimilar climate, came, and diſpoſſeſſed them. The Greeks, who retained almoſt every other part of the kingdom under their dominion, never had any ſway here. For this reaſon the Abruzzeſi ſtill bear a great reſemblance to their northern progenitors or maſters: to this day, one may trace in them the ſame goodneſs of heart, but great indolence, and repugnance to lively exertions; a fault that proceeds rather from a want of active virtue, than a diſpoſition to wickedneſs. Hence it comes that in theſe provinces, where the proximity of the frontier almoſt inſures impunity, fewer atrocious and inhuman deeds are heard of than in other parts of the realm. Remnants of ancient northern cuſtoms exiſted here ſo late as the beginning of this century, and, among the mountaineers, very evident traces of the Frank and Teutonic languages may be diſcovered.

ABSALOM, the ſon of David by Maacah, was brother to Thamar, David's daughter, who was raviſhed by Amnon their eldeſt brother by another mother. Abſalom waited two years for an opportunity of revenging the injury done to his ſiſter; and at laſt procured the aſſaſſination of Amnon at a feaſt which he had prepared for the king's ſons. He took refuge with Talmai king of Geſhur; and was no ſooner reſtored to favour, but he engaged the Iſraelites to revolt from his father. Abſalom was defeated in the wood of Ephraim: as he was flying, his hair caught hold of an oak, where he hung till Joab came and thruſt him through with three darts: David had expreſsly ordered his life to be ſpared, and extremely lamented him.

ABSCESS, in ſurgery; from *abſcedo*, to depart. A cavity containing pus; or, a gathering of matter in a part: So called, becauſe the parts which were joined are now ſeparated; one part recedes from another, to make way for the collected matter. See SURGERY.

ABSCISSE, in conics, a part of the diameter or tranſverſe axis of a conic ſection intercepted between the vertex or ſome other fixed point and a ſemiordinate. See *Conic Sections*.

ABSCONSA, a dark lanthern uſed by the monks at the ceremony of burying their dead.

ABSENCE, in Scots law: When a perſon cited before a court does not appear, and judgment is pronounced, that judgment is ſaid to be *in abſence*. No perſon can be tried criminally in abſence.

ABSINTHIATED, any thing tinged or impregnated with abſinthium or wormwood. Bartholin mentions a woman whoſe milk was become abſinthiated, and rendered as bitter as gall, by the too liberal uſe of wormwood.

Vinum abſinthites, or *poculum abſinthiatum*, "wormwood wine," is much ſpoke of among the ancients as a wholeſome drink, and even an antidote againſt drunkenneſs; though ſome have charged it with being offenſive to the head, and liable to cauſe fevers, cephalalgias, vomitings, uterine fluxes, &c. Ray alſo makes it a preventative of venery. According to the common opinion, it is made by infuſing the leaves of the plant in wine; but, according to Fehr, it ought to be prepared by fermentation, in order to correct the crudities, and call forth a volatile ſalt; which laſt, however, does not exiſt in wormwood. Some prefer the diſtilled water; but whatever virtues wormwood poſſeſſes reſide entirely in its eſſential oil.

ABSINTHIUM, in botany, the trivial name of the common wormwood. See the article ARTEMISIA.

ABSIS, in aſtronomy, the ſame with apſis. See APSIS.

ABSOLUTE, in a general ſenſe, ſomething that ſtands free or independent.

ABSOLUTE is more particularly underſtood of a being or thing which does not proceed from any cauſe, or does not ſubſiſt by virtue of any other being, conſidered as its cauſe; in which ſenſe, God alone is *abſolute*. *Abſolute*, in this ſenſe, is ſynonimous with *independent*, and ſtands oppoſed to *dependent*.

ABSOLUTE alſo denotes a thing's being free from conditions or limitations; in which ſenſe the word is ſynonimous with *unconditional*. We ſay, an *abſolute* decree, *abſolute* promiſe, *abſolute* obedience.

ABSOLUTE Government, that wherein the prince is left ſolely to his own will, being not limited to the obſervance of any laws except thoſe of his own diſcretion.

ABSOLUTE Equation, in aſtronomy, is the aggregate of the optic and eccentric equations. The apparent inequality of a planet's motion ariſing from its not being equally diſtant from the earth at all times, is called its optic equation, and would ſubſiſt even if the planet's real motion were uniform. The eccentric inequality is cauſed by the planet's motion being uniform. To illuſtrate which, conceive the ſun to move, or to appear to move, in the circumference of a circle, in whoſe centre the earth is placed. It is manifeſt, that if the ſun moves uniformly in this circle, it muſt appear to move uniformly to a ſpectator on the earth, and in this caſe there will be no optic nor eccentric equation: but ſuppoſe the earth to be placed out of the centre of the circle, and then, though the ſun's motion ſhould be really uniform, it would not appear to be ſo, being ſeen from the earth; and in this caſe there would be an optic equation, without an eccentric one. Imagine farther, the ſun's orbit to be not circular, but elliptic, and the earth in its focus; it will be as evident that the ſun cannot appear to have an uniform motion in ſuch ellipſe; ſo that his motion will then be ſubject to two equations, the optic and the eccentric.

ABSOLUTE Number, in algebra, is any pure number ſtanding in any equation without the conjunction of literal characters; as $2x+36=48$; where 36 and 48 are abſolute numbers, but 2 is not, as being joined with the letter x.

ABSOLUTION, in civil law, is a ſentence whereby the party accuſed is declared innocent of the crime laid to his charge.—Among the Romans, the ordinary method of pronouncing judgment was this: after the cauſe had been pleaded on both ſides, the præco uſed the word *dixerunt*, q. d. they have ſaid what they had to ſay; then three ballots were diſtributed to each judge, marked as mentioned under the article A; and as the majority fell of either mark, the accuſed was *abſolved* or condemned, &c. If he were abſolved, the prætor diſmiſſed him with *videtur non feciſſe*, or *jure videtur feciſſe*.

ABSOLUTION, in the canon law, is a juridical act, whereby the prieſt declares the ſins of ſuch as are penitent remitted.—The Romaniſts hold abſolution a part of the ſacrament of penance: the council of Trent, ſeſſ. xiv. cap. iii. and that of Florence, in the decree *ad Armenos*, declare the form or eſſence of the ſacrament to lie in the words of *abſolution*, I abſolve thee of thy ſins. The *formula* of abſolution, in the Romiſh church, is abſolute: in the Greek church, it is deprecatory; and in the churches of the reformed, declarative.

ABSOLUTION is chiefly uſed among Proteſtants for a ſentence whereby a perſon who ſtands excommunicated is releaſed or freed from that puniſhment.

ABSORBENT, in general, any thing poſſeſſing the faculty of *abſorbing*, or ſwallowing up another.

ABSORBENT Medicines, teſtaceous powders, as chalk, crab-eyes, &c. which are taken inwardly for drying up or abſorbing any acid or redundant humours in the ſtomach or inteſtines. They are likewiſe applied outwardly to ulcers or ſores with the ſame intention.

ABSORBENT Veſſels, a name given promiſcuouſly to the lacteal veſſels, lymphatics, and inhalent arteries. See ANATOMY.

Naturaliſts ſpeak of the like abſorbents in plants, the fibrous or hairy roots of which are as a kind of vaſa abſorbentia, which attract and imbibe the nutritious juices from the earth. See PLANTS.

ABSORBING, the ſwallowing up, ſucking up, or imbibing, any thing: thus black bodies are ſaid to abſorb the rays of light; luxuriant branches, to abſorb or waſte the nutritious juices which ſhould feed the fruit of trees, &c.

ABSORPTION, in the animal œconomy, is the power whereby the abſorbent veſſels imbibe the juices, &c.

ABSORPTIONS of the Earth, a term uſed by Kircher and others for the ſinking in of large tracts of land by means of ſubterranean commotions, and many other accidents.

Pliny tells us, that in his time the mountain Cymbotus, with the town of Eurites, which ſtood on its ſide, were wholly abſorbed into the earth, ſo that not the leaſt trace of either remained; and he records the like fate of the city Tantalis in Magneſia, and after it of the mountain Sypelus, both thus abſorbed by a violent opening of the earth. Galanis and Garnatus, towns once famous in Phœnicia, are recorded to have met the ſame fate; and the vaſt promontory, called *Phlegium*, in Ethiopia, after a violent earthquake in the night-time, was not to be ſeen in the morning, the whole having diſappeared, and the earth cloſed over it. Theſe, and many other hiſtories, atteſted by the authors of greateſt credit among the ancients, abundantly prove the fact in the earlier ages; and there have not been wanting too many inſtances of more modern date. *Kircher's Mund. Subter.* p. 77. See EARTH and EARTHQUAKE.

ABSORUS, APSORUS, ABSYRTIS, ABSYRTIDES, APSYRTIDES, APSYRTIS, and ABSYRTIUM, (Strabo, Mela, Ptolemy ;) iſlands in the Adriatic, in the gulf of Carnero: ſo called from Abſyrtus, Medea's brother, there ſlain. They are either one iſland, or two, ſeparated by a narrow channel, and joined by a bridge ; and are now called *Cherſo* and *Oſero*.

ABSTEMII, in church-hiſtory, a name given to ſuch perſons as could not partake of the cup of the euchariſt on account of their natural averſion to wine. Calviniſts allow theſe to communicate in the ſpecies of bread only, touching the cup with their lip; which, on the other hand, is by the Lutherans deemed a profanation.

ABSTEMIOUS, is properly underſtood of a perſon who refrains abſolutely from all uſe of wine.

The hiſtory of Mr. Wood, in the Medic. Tranſ. vol. ii. p. 261. art. 18. is a very remarkable exemplification of the very beneficial alterations which may be effected on the human body by a ſtrict courſe of abſtemiouſneſs.

The Roman ladies, in the firſt ages of the republic, were all enjoined to be abſtemious ; and that it might appear, by their breath, whether or no they kept up to the injunction, it was one of the laws of the Roman civility, that they ſhould kiſs their friends and relations whenever they accoſted them.

ABSTEMIUS (Laurentius), a native of Macerata, profeſſor of belles lettres in Urbino, and librarian of duke Guido Ubaldo, under the pontificate of Alexander VI. He wrote, 1. Notes on moſt difficult paſſages of ancient authors. 2. Hecatomythium, *i. e.* A collection of an 100 fables, &c. which have been often printed with thoſe of Æſop, Phædrus, Gabrias, Avienus, &c.

ABSTERGENT MEDICINES, thoſe employed for reſolving obſtructions, concretions, &c. ſuch as ſoap, &c.

ABSTINENCE, in a general ſenſe, the act or habit of refraining from ſomething which we have a propenſion to, or find pleaſure in.—Among the Jews, various kinds of abſtinence were ordained by their law. Among the primitive Chriſtians, ſome denied themſelves the uſe of ſuch meats as were prohibited by that law, others looked upon this abſtinence with contempt; as to which, St. Paul gives his opinion Rom. xiv. 1—3. The council of Jeruſalem, which was held by the Apoſtles, enjoined the Chriſtian converts to abſtain from meats ſtrangled, from blood, from fornication, and from idolatry. Abſtinence, as preſcribed by the goſpel, is intended to mortify and reſtrain the paſſions, to humble our vicious natures, and by that means raiſe our minds to a due ſenſe of devotion. But there is another ſort of abſtinence, which may be called *ritual*, and conſiſts in abſtaining from particular meats at certain times and ſeaſons. It was the ſpiritual monarchy of the weſtern world which firſt introduced this ritual abſtinence ; the rules of which were called *rogations ;* but groſsly abuſed from the true nature and deſign of faſting.—In England, abſtinence from fleſh has been enjoined by ſtatute even ſince the reformation, particularly on Fridays and Saturdays, on vigils, and on all commonly called *fiſh-days*. The like injunctions were renewed under Q. Elizabeth : but at the ſame time it was declared, that this was done not out of motives of religion, as if there were any difference in meats; but in favour of the conſumption of fiſh, and to multiply the number of fiſhermen and mariners, as well as ſpare the flock of ſheep. The great faſt, ſays St. Auguſtin, is to abſtain from ſin.

ABSTINENCE is more particularly uſed for a ſpare diet, or a ſlender parſimonious uſe of food, below the ordinary ſtandard of nature. The phyſicians relate wonders of the effects of abſtinence in the cure of many diſorders, and protracting the term of life. The noble Venetian, Cornaro, after all imaginable means had proved vain, ſo that his life was deſpaired of at 40, recovered, and lived to near 100, by mere dint of abſtinence ; as he himſelf gives the account. It is indeed ſurpriſing to what a great age the primitive Chriſtians of the eaſt, who retired from the perſecutions into the deſarts of Arabia and Egypt, lived, healthful and cheerful, on a very little food. Caſſian aſſures us, that the common rate for 24 hours was 12 ounces of bread, and mere water ; with this St. Anthony lived 105 years ; James the Hermit 104 ; Arſenius, tutor of the Emperor Arcadius, 120 : S. Epiphanius, 115 ; Simeon the Stylite, 112 ; and Romauld, 120. Buchanan writes, that in Scotland, one Laurence preſerved himſelf to 140 by force of temperance and labour ; and Spotſwood mentions one Kentigern, afterwards called S. Mongah or Mungo, who lived to 185 by the ſame means. Other inſtances ſee under the article LONGEVITY.

Abſtinence, however, is to be recommended only as it means a proper regimen : for in general it muſt have bad conſequences when obſerved without a due regard to conſtitution, age, ſtrength, *&c.* According to Dr. Cheyne, moſt of the chronical diſeaſes, the infirmities of old age, and the ſhort lives of Engliſhmen, are owing to repletion ; and may be either cured, prevented, or remedied by abſtinence : but then the kinds of abſtinence which ought to obtain, either in ſickneſs or health, are to be deduced from the laws of diet and regimen.

Among the brute creation, we ſee extraordinary inſtances of long abſtinence. The ſerpent-kind, in particular, bear abſtinence to a wonderful degree. We have ſeen rattle-ſnakes that had ſubſiſted many months without any food, yet ſtill retained their vigour and fierceneſs. Dr. Shaw ſpeaks of a couple of ceraſtes, (a ſort of Egyptian ſerpents), which had been kept five years in a bottle cloſe corked, without any ſort of food, unleſs a ſmall quantity of ſand wherein they coiled themſelves up in the bottom of the veſſel may be reckoned as ſuch ; yet when he ſaw them, they had newly caſt their ſkins, and were as briſk and lively as if juſt taken. But it is even natural for divers ſpecies to paſs four, five, or ſix months every year, without either eating or drinking. Accordingly, the tortoiſe, bear, dormouſe, ſerpent, &c. are obſerved regularly to retire, at thoſe ſeaſons, to their reſpective cells, and hide themſelves, ſome in the caverns of rocks or ruins ; others dig holes under ground ; others get into woods, and lay themſelves up in the clefts of trees ; others bury themſelves under water, *&c.* And theſe animals are found as fat and fleſhy after ſome months abſtinence as before.—Sir G. Ent * weighed his tortoiſe ſeveral years ſucceſſively, at its going to earth in October, and coming out again in March ; and found, that, of four pounds,

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* *Phil. Tranſact.* n° 194.

four ounces, it only uſed to loſe about one ounce.—Indeed, we have inſtances of men paſſing ſeveral months as ſtrictly abſtinent as other creatures. In particular, the records of the Tower of London mention a Scotchman impriſoned for felony, and ſtrictly watched in that fortreſs for ſix weeks: in all which time he took not the leaſt ſuſtenance; for which he had his pardon. Numberleſs inſtances of extraordinary abſtinence, particularly from morbid cauſes, are to be found in the different periodical Memoirs, Tranſactions, Ephemerides, &c.—It is to be added, that, in moſt inſtances of extraordinary human abſtinence related by naturaliſts, there were ſaid to have been apparent marks of a texture of blood and humours, much like that of the animals abovementioned. Though it is no improbable opinion, that the air itſelf may furniſh ſomething for nutrition. It is certain, there are ſubſtances of all kinds, animal, vegetable, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration. And that an animal body may be nouriſhed thereby, is evident in the inſtance of vipers; which if taken when firſt brought forth, and kept from every thing but air, will yet grow very conſiderably in a few days. So the eggs of lizards are obſerved to increaſe in bulk, after they are produced, though there be nothing to furniſh the increment but air alone; in like manner as the eggs or ſpawn of fiſhes grow and are nouriſhed with the water. And hence, ſay ſome, it is that cooks, turnſpit-dogs, &c. though they eat but little, yet are uſually fat. See FASTING.

ABSTINENTS, or ABSTINENTES, a ſet of heretics that appeared in France and Spain about the end of the third century. They are ſuppoſed to have borrowed part of their opinions from the Gnoſtics and Manicheans, becauſe they oppoſed marriage, condemned the uſe of fleſh meat, and placed the Holy Ghoſt in the claſs of created beings. We have, however, no certain account of their peculiar tenets.

ABSTRACT, in a general ſenſe, any thing ſeparated from ſomething elſe.

ABSTRACT Idea, in metaphyſics, is a partial idea of a complex object, limited to one or more of the component parts or properties, laying aſide or abſtracting from the reſt. Thus, in viewing an object with the eye, or recollecting it in the mind, we can eaſily abſtract from ſome of its parts or properties, and attach ourſelves to others: we can attend to the redneſs of a cherry, without regard to its figure, taſte, or conſiſtence. See ABSTRACTION.

ABSTRACT Terms, words that are uſed to expreſs abſtract ideas. Thus beauty, uglineſs, whiteneſs, roundneſs, life, death, are abſtract terms.

ABSTRACT Numbers, are aſſemblages of units, conſidered in themſelves without denoting any particular and determined particulars. Thus 6 is an abſtract number, when not applied to any thing; but, if we ſay 6 feet, 6 becomes a concrete number. See the article NUMBER.

ABSTRACT Mathematics, otherwiſe called *Pure Mathematics*, is that which treats of magnitude or quantity, abſolutely and generally conſidered, without reſtriction to any ſpecies of particular magnitude; ſuch are Arithmetic and Geometry. In this ſenſe, abſtract mathematics is oppoſed to mixed mathematics; wherein ſimple and abſtract properties, and the relations of quantities primitively conſidered in pure mathematics, are applied to ſenſible objects, and by that means become intermixed with phyſical conſiderations: ſuch are Hydroſtatics, Optics, Navigation, &c.

ABSTRACT, in literature, a compendious view of any large work; ſhorter and more ſuperficial than an abridgment.

ABSTRACTION, in general, the act of abſtracting, or the ſtate of being abſtracted.

ABSTRACTION, in metaphyſics, the operation of the mind when occupied by abſtract ideas. A large oak fixes our attention, and abſtracts us from the ſhrubs that ſurround it. In the ſame manner, a beautiful woman in a crowd, abſtracts our thoughts, and engroſſes our attention ſolely to herſelf. Theſe are examples of real abſtraction: when theſe, or any others of a ſimilar kind, are recalled to the mind after the objects themſelves are removed from our ſight, they form what are called *abſtract ideas*, or the mind is ſaid to be employed in abſtract ideas. But the power of abſtraction is not confined to objects that are ſeparable in reality as well as mentally: the ſize, the figure, the colour of a tree are inſeparably connected, and cannot exiſt independent of each other; and yet we can mentally confine our obſervations to any one of theſe properties, neglecting or abſtracting from the reſt.

Abſtraction is chiefly employed theſe three ways. Firſt, When the mind conſiders any one part of a thing, in ſome reſpect diſtinct from the whole; as a man's arm, without the conſideration of the reſt of the body. Secondly, When we conſider the *mode* of any ſubſtance, omitting the ſubſtance itſelf; or when we ſeparately conſider ſeveral modes which ſubſiſt together in one ſubject. This abſtraction the geometricians make uſe of when they conſider the length of a body ſeparately which they call *a line*, omitting the conſideration of its breadth and thickneſs. Thirdly, It is by abſtraction that the mind forms general or univerſal ideas; omitting the modes and relations of the particular objects whence they are formed. Thus, when we ſhould underſtand a thinking being in general, we gather from our ſelf-conſciouſneſs what it is to think; and, omitting thoſe things which have a particular relation to our own minds, or to the human mind, we conceive a thinking being in general.

Ideas formed in this manner, which are what we properly call *abſtract ideas*, become general repreſentatives of all objects of the ſame kind; and their names applicable to whatever exiſts conformable to ſuch ideas. Thus the idea of colour that we receive from chalk, ſnow, milk, &c. is a repreſentative of all of that kind; and has a name given it, *whiteneſs*, which ſignifies the ſame quality wherever found or imagined.

ABSTRUSE, ſomething deep, hidden, concealed, or far removed from common apprehenſions, and therefore not eaſily underſtood; in oppoſition to what is obvious and palpable. Thus metaphyſics is an abſtruſe ſcience; and the doctrine of fluxions, and the method *de maximis et minimis*, are abſtruſe points of knowledge.

ABSURD, an epithet applied to any thing that oppoſes the human apprehenſion and contradicts a manifeſt truth. Thus, it would be abſurd to ſay that 6 and 6 make only 10, or to deny that twice 6 make 12. When the term *abſurd* is applied to actions, it has the ſame import as *ridiculous*.

ABSYNTHIUM. See ABSINTHIUM.

ABSYRTUS, in the heathen mythology, the ſon of Æta and Hypſea, and the brother of Medea. The latter running away with Jaſon, after her having aſſiſted him in carrying off the golden fleece, was purſued by her father; when, to ſtop his progreſs, ſhe tore Abſyrtus in pieces, and ſcattered his limbs in his way.

ABTHANES, a title of honour uſed by the ancient inhabitants of Scotland, who called their nobles *thanes*, which in the old Saxon ſignifies *king's miniſters*; and of theſe the higher rank were ſtyled *abthanes*, and thoſe of the lower *underthanes*.

ABUCCO, ABOCCO, or ABOCCHI, a weight uſed in the kingdom of Pegu. One abucco contains 12½ teccalis; two abuccos make a *giro* or *agire*; two *giri*, half a *biza*; and a *biza* weighs an hundred teccalis; that is, two pounds five ounces the heavy weight, or three pounds nine ounces the light weight of Venice.

ABUKESO, in commerce, the ſame with ASLAN.

ABULFARAGIUS (Gregory), ſon to Aaron a phyſician, born in 1226, in the city of Malatia, near the ſource of the Euphrates in Armenia. He followed the profeſſion of his father; and practiſed with great ſucceſs, numbers of people coming from the moſt remote parts to aſk his advice. However, he would hardly have been known at this time, had his knowledge been confined to phyſic: but he applied himſelf to the ſtudy of the Greek, Syriac, and Arabic languages, as well as philoſophy and divinity; and he wrote a hiſtory which does honour to his memory. It is written in Arabic, and divided into dynaſties. It conſiſts of ten parts, being an epitome of univerſal hiſtory from the creation of the world to his own time. Dr Pocock publiſhed it with a Latin tranſlation in 1663; and added, by way of ſupplement, a ſhort continuation relating to the hiſtory of the eaſtern princes.

ABUNA, the title given to the archbiſhop or metropolitan of Abyſſinia. See ABYSSINIA.

ABUNDANT NUMBER, in arithmetic, is a number, the ſum of whoſe aliquot parts is greater than the number itſelf. Thus the aliquot parts of 12, being 1, 2, 3, 4, and 6, they make, when added together, 16. An abundant number is oppoſed to a *deficient* number, or that which is greater than all its aliquot parts taken together; as 14, whoſe aliquot parts are 1, 2, and 7, which make no more than ten: and to a *perfect* number, or one to which its aliquot parts are equal, as 6, whoſe aliquot parts are 1, 2, and 3.

ABUNDANTIA, a heathen divinity, repreſented in ancient monuments under the figure of a woman with a pleaſing aſpect, crowned with garlands of flowers, pouring all ſorts of fruit out of a horn which ſhe holds in her right hand, and ſcattering grain with her left, taken promiſcuouſly from a ſheaf of corn. On a medal of Trajan, ſhe is repreſented with two cornucopiæ.

ABUSAID, (Ebn Aljaptu), ſultan of the Moguls, ſucceeded his father anno 717 of the hegira. He was the laſt monarch of the race of Jenghiz khan; and after his death, which happened the ſame year that Tamerlane was born, the empire was made a ſcene of blood and deſolation.

ABUS, (anc. geog.), a river of Britain, formed by the confluence of the Ure, the Derwent, Trent, &c. falling into the German ſea, between Yorkſhire and Lincolnſhire, and forming the mouth of the Humber.

ABUSE, an irregular uſe of a thing, or the introducing ſomething contrary to the true intention thereof. In grammar, to apply a word *abuſively*, or in an *abuſive* ſenſe, is to miſapply or pervert its meaning.—A permutation of benefices, without the conſent of the biſhop, is termed *abuſive*, and conſequently null.

ABUTILON, in botany, the trivial name of ſeveral ſpecies of the ſida. See SIDA.

ABYDOS, (anc. geog.), anciently a town built by the Mileſians in Aſia, on the Helleſpont, where it is ſcarce a mile over, oppoſite to Seſtos on the European ſide. Now both called the *Dardanelles*. Abydos lay midway between Lampſacus and Ilium, famous for Xerxes's bridge, (Herodotus, Virgil); and for the loves of Leander and Hero, (Muſæus, Ovid); celebrated alſo for its oyſters, (Ennius, Virgil). The inhabitants were a ſoft, effeminate people, given much to detraction; hence the proverb, *Ne temere Abydum*, when we would caution againſt danger, (Stephanus).

ABYDOS, (anc. geog.), anciently an inland town of Egypt, between Ptolemais and Dioſpolis Parva, towards Syene; famous for the palace of Memnon and the temple of Oſiris. A colony of Mileſians; (Stephanus.) It was the only one in the country into which the ſingers and dancers were forbid to enter.

This city, reduced to a village under the empire of Auguſtus, now preſents to our view only an heap of ruins without inhabitants; but to the weſt of theſe ruins is ſtill found the celebrated tomb of Iſmandes. The entrance is under a portico 60 feet high, and ſupported by two rows of maſſy columns. The immoveable ſolidity of the edifice, the huge maſſes which compoſe it, the hieroglyphics it is loaded with, ſtamp it a work of the ancient Egyptians. Beyond it is a temple 300 feet long and 145 wide. Upon entering the monument we meet with an immenſe hall, the roof of which is ſupported by 28 columns 60 feet high and 19 in circumference at the baſe. They are 12 feet diſtant from each other. The enormous ſtones that form the ceiling, perfectly joined and incruſted, as it were, one in the other, offer to the eye nothing but one ſolid platform of marble 126 feet long and 26 wide. The walls are covered with hieroglyphics. One ſees there a multitude of animals, birds, and human figures with pointed caps on their heads, and a piece of ſtuff hanging down behind, dreſſed in looſe robes that come down only to the waiſt. The ſculpture, however, is clumſy; the forms of the body, the attitudes and proportions of the members, ill obſerved. Amongſt theſe we may diſtinguiſh ſome women ſuckling their children, and men preſenting offerings to them. Here alſo we meet with the divinities of India. Monſieur Chevalier, formerly governor of Chandernagore, who reſided 20 years in that country, carefully viſited this monument on his return from Bengal. He remarked here the gods *Jaggrenat*, *Gonez*, and *Vechnou* or *Wiſhnou*, ſuch as they are repreſented in the temples of Indoſtan.—A great gate opens at the bottom of the firſt hall, which leads to an apartment 46 feet long by 22 wide. Six ſquare pillars ſupport the roof of it; and at the angles are the doors of four other chambers, but ſo choaked up with rubbiſh that they cannot now be entered. The laſt hall, 64 feet long by 24 wide, has ſtairs by which one deſcends into the ſubterraneous apartments of this grand edifice. The Arabs, in ſearching after treaſure, have piled up heaps of earth and rubbiſh. In the part we are able to penetrate, ſculpture and hieroglyphics are diſcoverable as in the upper ſtory. The natives ſay that they correſpond exactly with thoſe above ground, and that the columns are as deep in the earth as they are lofty above ground. It would be dangerous to go far into theſe vaults; for the air of them is ſo loaded with a mephitic vapour, that a candle can ſcarce be kept burning in them. Six lions heads, placed on the two ſides of the temple, ſerve as ſpouts to carry off the water. You mount to the top by a ſtaircaſe of a very ſingular ſtructure. It is built with ſtones incruſted in the wall, and projecting ſix feet out; ſo that being ſupported only at one end, they appear to be ſuſpended in the air. The walls, the roof, and the columns of this edifice, have ſuffered nothing from the injuries of time; and did not the hieroglyphics, by being corroded in ſome places, mark its antiquity, it would appear to have been newly built. The ſolidity is ſuch, that unleſs people make a point of deſtroying it, the building muſt laſt a great number of ages. Except the coloſſal figures, whoſe heads ſerve as an ornament to the capitals of the columns, and which are ſculptured *in relievo*, the reſt of the hieroglyphics which cover the inſide are carved in ſtone. To the left of this great building we meet with another much ſmaller, at the bottom of which is a ſort of altar. This was probably the ſanctuary of the temple of Oſiris.

ABYLA, (Ptolemy, Mela); one of Hercules's pillars on the African ſide, called by the Spaniards *Sierra de las Monas*, over againſt Calpe in Spain, the other pillar; ſuppoſed to have been formerly joined, but ſeparated by Hercules, and thus to have given entrance to the ſea now called the *Mediterranean:* the limits of the labours of Hercules, (Pliny).

ABYSS, in a general ſenſe, denotes ſomething profound, and, as it were, bottomleſs. The word is originally Greek, αϐυσσος; compounded of the primitive α, and βυσσος, *q. d.* without a bottom.

Abyss, in a more particular ſenſe, denotes a deep maſs or fund of waters. In this ſenſe, the word is particularly uſed, in the Septuagint, for the water which God created at the beginning with the earth, which encompaſſed it round, and which our tranſlators render by *deep*. Thus it is that darkneſs is ſaid to have been on the face of the abyſs.

Abyss is alſo uſed for an immenſe cavern in the earth, wherein God is ſuppoſed to have collected all thoſe waters on the third day; which, in our verſion, is rendered the *ſeas*, and elſewhere the *great deep*. Dr Woodward, in his Natural Hiſtory of the Earth, aſſerts, That there is a mighty collection of waters incloſed in the bowels of the earth, conſtituting a huge orb in the interior or central parts of it; and over the ſurface of this water he ſuppoſes the terreſtrial ſtrata to be expanded. This, according to him, is what Moſes calls *the great deep*, and what moſt authors render *the great abyſs*. The water of this vaſt abyſs, he alleges, does communicate with that of the ocean, by means of certain hiatuſes or chaſms paſſing betwixt it and the bottom of the ocean: and this and the abyſs he ſuppoſes to have one common centre, around which the water of both is placed; but ſo, that the ordinary ſurface of the abyſs is not level with that of the ocean, nor at ſo great a diſtance from the centre as the other, it being for the moſt part reſtrained and depreſſed by the ſtrata of earth lying upon it: but wherever thoſe ſtrata are broken, or ſo lax and porous that water can pervade them, there the water of the abyſs aſcends; fills up all the clefts and fiſſures into which it can get admittance; and ſaturates all the interſtices and pores of the earth, ſtone, or other matter, all around the globe, quite up to the level of the ocean.

The exiſtence of an abyſs or receptacle of ſubterraneous waters, is controverted by Camerarius *; and defended by Dr Woodward chiefly by two arguments: the firſt drawn from the vaſt quantity of water which covered the earth in the time of the deluge; the ſecond, from the conſideration of earthquakes, which he endeavours to ſhow are occaſioned by the violence of the waters in this abyſs. A great part of the terreſtrial globe has been frequently ſhaken at the ſame moment; which argues, according to him, that the waters, which were the occaſion thereof, were co-extended with that part of the globe. There are even inſtances of univerſal earthquakes; which (ſays he) ſhow that the whole abyſs muſt have been agitated: for ſo general an effect muſt have been produced by as general a cauſe, and that cauſe can be nothing but the ſubterraneous abyſs †.

To this abyſs alſo has been attributed the origin of ſprings and rivers; the level maintained in the ſurface of different ſeas; and their not overflowing their banks. To the effluvias emitted from it, ſome even attribute all the diverſities of weather and changes in our atmoſphere ‡. Ray §, and other authors, ancient as well as modern, ſuppoſe a communication between the Caſpian ſea and the ocean by means of a ſubterranean abyſs: and to this they attribute it that the Caſpian does not overflow, notwithſtanding the great number of large rivers it receives, of which Kempfer reckons above 50 in the compaſs of 60 miles; tho' as to this, others ſuppoſe that the daily evaporation may ſuffice to keep the level.

The different arguments concerning this ſubject may be ſeen collected and amplified in *Cockburn's Inquiry into the Truth and Certainty of the Moſaic Deluge*, p. 271, &c. After all, however, this amazing theory of a central abyſs is far from being demonſtrated: it will perhaps in ſeveral reſpects appear inconſiſtent with ſound philoſophy, as well as repugnant to the phenomena of nature. In particular, if we believe any thing like elective attraction to have prevailed in the formation of the earth, we muſt believe that the ſeparation of the chaos proceeded from the union of ſimilar particles. It is certain that reſt is favourable to ſuch operations of nature. As, therefore, the central parts of the earth were more immediately quieſcent than thoſe remote from the centre, it ſeems abſurd to ſuppoſe that the heavier and denſer bodies gave place to the more light and fluid; that the central part ſhould conſiſt of water only, and the more ſuperficial part of a cruſt or ſhell. Vid. *Whitehurſt's Inquiry into the original Formation of the Strata*, &c. See Deluge.

Abyss is alſo uſed to denote hell; in which ſenſe the word is ſynonymous with what is otherwiſe called *Barathrum*, *Erebus*, and *Tartarus;* in the Engliſh bible, the *bottomleſs pit*. The unclean ſpirits expelled by

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* Diſſert. Taur. Acta Erud. ſupp. tom. vi. p. 24.

† Hiſt. of the Earth. Journal de Scavens, tom. lviii. p. 393. Memoirs of Literature, tom. viii. p. 101, &c.

‡ Holloway Introd. to Woodward's Hiſt of the Earth Acta Erud. 1727 p. 313.

§ Phyſico-Theol. Diſc. ii. c. 2. p. 76.

Chriſt, begged, *ne imperaret ut in abyſſum irent*, according to the vulgate; εις αϐυσσον, according to the Greek. Luke viii. 31. Rev. ix. 1.

Abyss is more particularly uſed, in antiquity, to denote the temple of Proſerpine. It was thus called on account of the immenſe fund of gold and riches depoſited there; ſome ſay, hid under ground.

Abyss is alſo uſed in heraldry to denote the centre of an eſcutcheon. In which ſenſe a thing is ſaid to be bore in abyſs, *en abyſme*, when placed in the middle of the ſhield, clear from any other bearing: He bears azure, a flower de lis, in abyſs.

ABYSSINIA, by ſome called *Higher Ethiopia*, and by the Arabians *Al Habaſh*, is bounded on the north by Nubia; on the eaſt, by the Arabic gulph or Red Sea, and the kingdom of Adel; on the ſouth, by the kingdoms of Ajan, Alabo, and Gingiro; and on the weſt, by the kingdoms of Goram, and part of Gingiro; and is divided into a great number of provinces. The principal river is the Nile, which has its ſource in this country; and the moſt conſiderable lake, that of Dambea, which diſcharges itſelf into the Nile, is about 700 miles in length, and 90 in breadth. The air is pretty temperate in the mountains, and therefore their towns and ſtrong holds are generally placed on them; but in the vallies it is hot and ſuffocating. The ſoil and face of the country is various. In ſome places there are nothing but rocks and profound caverns: in others, eſpecially where there are rivers, the land is exceedingly fruitful; and the banks of theſe ſtreams are bordered with flowers of various kinds, many of which are unknown in Europe. The torrents in the rainy ſeaſon waſh a great deal of gold from the mountains. This ſeaſon begins in May, when the ſun is vertical, or directly over their heads, and ends in September.—The country produces a great variety of animals, both tame and wild, ſuch as lions, tigers, rhinoceroſes, leopards, elephants, monkeys, ſtags, deer; horſes, camels, dromedaries, goats, cows, ſheep; likewiſe oſtriches, with a vaſt variety of other birds. In the rivers are crocodiles and the hippopotamus. Travellers mention alſo a peculiar kind of bees, ſmall, black, and without a ſting, which hive in the earth, and make honey and wax that are extremely white. The country is greatly infeſted with locuſts, which devour every thing that is green wherever they come.

The inhabitants are Moors, Pagans, Jews, and Chriſtians. The laſt was the reigning and eſtabliſhed religion when father Lobo viſited this country in 1624. This diverſity of people and religion is the reaſon that the kingdom, in different parts, is under different forms of government, and that their laws and cuſtoms are extremely various. Some of the people neither ſow their lands nor improve them; but live on milk and fleſh, and encamp like the Arabs, without any ſettled habitation. In ſome places they practiſe no rites of worſhip, though they believe that there dwells in the regions above a Being who governs the world: This deity they call *Oul*. In theſe parts where Chriſtianity is profeſſed, it is ſo corrupted with ſuperſtitious errors, and ſo mingled with ceremonies borrowed from the Jews, that little beſide the name of Chriſtianity is to be found among them. (See the next article.)—They have two harveſts in the year; one in winter, (which begins in May, and laſts, with great rigour, through the months of July, Auguſt, and September); and the other in ſpring. Every man who has a thouſand cows ſaves once a-year a day's milk, and makes a bath for his friends; ſo that to give an idea of a man's wealth, their common expreſſion is, *he bathes ſo many times a-year*. Their males marry about ten years old, and their females younger. Their marriage tie is ſo looſe, that they part whenever they find they cannot live agreeably together.

Beſides the large towns, there are a great number of villages, which in ſome places are ſo thick ſown, that they look like one continued town: the houſes are very mean, being but one ſtory high, and built of ſtraw, earth, and lime. In moſt of the towns the houſes are ſeparated by hedges, which are always green, and mixed with flowers and fruit-trees at a certain diſtance from each other, which affords an agreeable proſpect.—The government is monarchical. The ſovereign has the title of Negus, and is an abſolute prince. When he is in camp, the tents are ſo regularly diſpoſed as to have the appearance of a city; and there is a captain over every diviſion, to prevent diſorders, and to execute juſtice.

The Abyſſines in general are of an olive complexion, tall, graceful, and well featured. Thoſe who are neither mechanics nor tradeſmen (which few of them are) nor tillers of the ground, are inured to bear arms, which are a head-piece, a buckler, a coat of mail, bows and arrows, darts, pikes capped with iron at both ends, a ſling, and a ſword; they have very few fire-arms, and thoſe were introduced by the Portugueſe. The habit of perſons of quality is a fine ſilken veſt, or fine cotton, with a kind of ſcarf. The citizens have the ſame habit, only coarſer. The common people have nothing but a pair of cotton drawers, and a ſcarf which covers the reſt of their body. The women are of a healthy conſtitution, active, and moderately handſome, having neither flat noſes nor thick lips like the negroes; and nature is ſo friendly, that they ſtand in little need of midwives, which is indeed the caſe of moſt countries in the torrid zone. They appear in public as in Europe, without being forbid the converſation of the men as among the Mahometans. Princeſſes of the royal blood are not permitted to marry foreigners: and when they take the air, they go in great ſtate, with 400 or 500 women attendants. Their language is the Ethiopic, which bears a great affinity with the Arabic; but particular provinces have a different dialect.

Manufactures are almoſt wholly wanting in this country; and the few trades which they have amongſt them are always conveyed from the father to the children. They ſeem indeed by their churches, and other ruinated places, to have had a knowledge of architecture. But the workmen were ſent for from other countries, and were forced to do all themſelves; ſo that when theſe fabrics were reared, eſpecially the imperial palace built, by Peter Pais, a Portugueſe architect, the people flocked from all parts of Ethiopia to view it, and admired it as a new wonder of the world.—Gold, ſilver, copper, and iron, are the principal ores with which their mines abound in this extenſive part of Africa: but not above one third part is made uſe of by way of merchandize, or converted into money; of which they have little or no uſe in Abyſſinia. They cut their gold indeed into ſmall pieces for the pay of their troops, and for expences of the court, which is but a modern cuſtom among them; the king's gold, before the end of the 17th century, being laid up in his treaſury in ingots, with intent to be never carried out, or never uſed in any thing but veſſels and trinkets for the ſervice of the palace. In the lieu of ſmall money, they make uſe of rock ſalt as white as ſnow and as hard as ſtone. This is taken out of the mountain of Laſta, and put into the king's warehouſes; where it is reduced into tablets of a foot long, and three inches broad, ten of which are worth about a French crown. When they are circulated in trade, they are reduced into ſtill ſmaller pieces, as occaſion requires. This ſalt is alſo applied to the ſame purpoſe as common ſea-ſalt. With this mineral ſalt they purchaſe pepper, ſpices, and ſilk ſtuffs, which are brought to them by the Indians, in their ports in the Red Sea. Cardamums, ginger, aloes, myrrh, caſſia, civet, ebony-wood, ivory, wax, honey, cotton, and linens of various ſorts and colours, are merchandiſes which may be had from Abyſſinia; to which may be added ſugar, hemp, flax, and excellent wines, if theſe people had the art of preparing them. It is affirmed there are in this country the fineſt emeralds that are any where to be found; and, though they are found but in one place, they are there in great quantities, and ſome ſo large and ſo perfect as to be of almoſt ineſtimable value. The greateſt part of the merchandiſes above mentioned, are more for foreign than inland trade. Their domeſtic commerce conſiſts chiefly in ſalt, honey, buck-wheat, grey peaſe, citrons, oranges, lemons, and other proviſions, with fruits and herbage neceſſary for the ſupport of life. Thoſe places that the Abyſſinian merchants frequent the moſt, who dare venture to carry their commodities by ſea themſelves, are Arabia Felix, and the Indies, particularly Goa, Cambaye, Bengal, and Sumatra. With regard to their ports on the Red Sea, to which foreign merchants commonly reſort, the moſt conſiderable are thoſe of Mette, Azum, Zajallah, Maja, Dazo, Patea, and Brava. The trade of the Abyſſinians by land is inconſiderable. There are, however, bands of them who arrive yearly at Egypt, particularly at Cairo, laden with gold-duſt, which they bring to barter for the merchandiſes of that country, or of Europe, for which they have occaſion. Theſe caſilas or caravans, if we may be allowed thus to call a body of 40 or 50 poor wretches who unite together for their mutual aſſiſtance in their journey, are commonly three or four months on their route, traverſing foreſts and mountains almoſt impaſſable, in order to exchange their gold for neceſſaries for their families, and return immediately with the greateſt part of the merchandiſe on their backs. Frequently the Jews or Egyptians give them large credit; which may ſeem ſurpriſing, as they are beyond recourſe if they ſhould fail of payment. But experience has ſhown, that they have never abuſed the confidence repoſed in them; and even in the event of death, their fellow-travellers take care of the effects of the deceaſed for the benefit of their families, but in the firſt place for the diſcharge of thoſe debts contracted at Cairo.—It remains only to be obſerved, that one of the principal branches of trade of the Abyſſines is that of ſlaves; who are greatly eſteemed in the Indies and Arabia for the beſt, and moſt faithful, of all that the other kingdoms of Africa furniſh. The Indian and Arabian merchants frequently ſubſtitute them as their factors: and, on account of their good ſervices and integrity, not only often give them their liberty but liberally reward them.

Into this part of the globe the admiſſion of travellers has been ſuppoſed extremely difficult, and their return from thence almoſt impracticable. A Scotch gentleman, however, of family and fortune, James Bruce, Eſq; of Kinnaird, is known not only to have entered that country, but to have reſided in it ſeveral years, and returned ſafe home, bringing with him many great curioſities. Soon after his return, the following notice was given by the Count de Buffon in an advertiſement prefixed to the 3d volume of his Hiſtory of Birds: "A new aid which I have received, and which I am anxious to announce to the public, is the free and generous communication which I had of the drawings and obſervations of James Bruce, Eſq; of Kinnaird, who returning from Numidia, and the interior parts of Abyſſinia, ſtopt in my houſe for ſeveral days, and made me a partaker of the knowledge which he had acquired in a tour no leſs fatiguing than hazardous. It filled me with the utmoſt aſtoniſhment to view the numerous drawings which he had made and coloured himſelf. He poſſeſſes the moſt perfect repreſentations and deſcriptions of the birds, fiſhes, plants, edifices, monuments, dreſs, arms, &c. of different nations, all of them objects worthy of knowledge. Nothing has eſcaped his curioſity, and his talents have been proportioned to it. The Engliſh government will without doubt take proper meaſures for the publication of his work. That reſpectable nation, which has given a lead to all others in diſcoveries of every kind, will not fail to add to its glory, by ſpeedily communicating to the world at large, thoſe of this excellent traveller, who, not contented with accurate deſcriptions of nature, has made many important obſervations on the culture of different kinds of grains; on the navigation of the Red Sea; on the courſe of the Nile, from its mouth to its ſource, which he has been the firſt to diſcover; and on different particulars which may be of the higheſt utility to commerce and agriculture, thoſe great arts which are but little known and ill cultivated. Yet, on theſe alone, the ſuperiority of one nation over another does depend, and for ever will depend."

It is much to be regretted, that after ſo long an interval, this gentleman's diſcoveries have not yet made their appearance. The delay has given riſe to various ſpeculations. Doubts have even been entertained concerning the credibility of the reports that have tranſpired, or been gathered from his converſation. His honour and abilities, however, are too extenſively known to be affected by ſuch injurious inſinuations. That he hath great talents for the information of his readers, appears by his diſſertation on the Theban harp*, which Dr Burney hath inſerted in the firſt volume of his Hiſtory of Muſic, and in which are alſo mentioned ſeveral of the Abyſſinian inſtruments. Mr Bruce, moreover, is ſaid to have a great facility in learning languages, and talents for drawing; nor perhaps was any other traveller furniſhed with ſo large and ſcientific an apparatus of inſtruments. Add to all this, that he is poſſeſſed of a ſpirit and enterpriſe not eaſily to be equalled. The ſpeedy production, therefore, of ſo intereſting an account as he is capable of giving, of this almoſt unfrequented part of Africa, cannot but ſtill be earneſtly wiſhed for. In the mean time the following authentic anecdotes will not, it is preſumed, be unacceptable, nor appear foreign to the preſent article.

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* See the article HARP in this Dictionary.

Mr Bruce was appointed conſul to Algiers, where he continued till 1765. In June 1764, he requeſted leave of abſence from the ſecretary of ſtate for the ſouthern department, in order to make ſome drawings of antiquities near Tunis.

In Mr Bruce's laſt letter from Algiers to the ſame ſecretary (dated December 29, 1764.) he alludes to another leave of abſence, which he had likewiſe requeſted, that he might viſit parts of the African continent. He explains himſelf no farther in this letter; but it is believed that he proceeded conſiderably to the ſouthward of Algiers, and made thoſe very capital drawings of remains of Roman architecture, which many have ſeen ſince his return to Britain. Before he ſet out for Algiers, he informed ſome of his friends, that the making ſuch excurſions for theſe intereſting purpoſes was his principal inducement for accepting the conſulſhip.

How long he continued in Africa, the preſent writer has not had the opportunity of procuring information; but having intentions afterwards of viſiting Palmyra, he was ſhipwrecked on the coaſt of Tunis, and plundered of every thing by the barbarous inhabitants.

The moſt diſtreſſing part of the loſs was probably that of his inſtruments, ſo neceſſary to a ſcientific traveller; and though he afterwards procured ſome of theſe, yet others (particularly a quadrant) could not be recovered. Mr Bruce, however, determining to repair this loſs as ſoon as poſſible from France, ſo much nearer to him than England, was ſo fortunate as to be provided with a time-piece and quadrant from that quarter. Upon this occaſion Lewis XV. preſented him with an iron quadrant of four feet radius, as he had probably repreſented to the academy of ſciences his want of ſuch an inſtrument whilſt he ſhould be in Abyſſinia: Mr Bruce brought back with him to England this cumbrous fellow-traveller, and, having put upon it an inſcription to the following purport, is ſaid to have preſented it to the univerſity of Glaſgow: "With this inſtrument given by the king of France, Lewis XV. Mr Bruce proceeded to the ſources of the Nile, it being carried on foot, upon mens ſhoulders, over the mountains of Abyſſinia." This information was received from that eminent maker of inſtruments Mr Nairne.

Where and when Mr Bruce received the French inſtruments is not known; but as he was ſtill bent on viſiting Abyſſinia, he gave a commiſſion to Mr W. Ruſſel, F. R. S. for a reflecting teleſcope, made by *Bird* or *Short*; a watch with a hand to point ſeconds, and the neweſt and completeſt Engliſh aſtronomical tables; all of which were to be ſent to Mr Fremaux, and forwarded to him at Alexandria before Auguſt. On the 29th of March 1768, Mr Bruce was at Sidon on the coaſt of Syria, and wrote to Mr Ruſſel from thence for the following additional inſtruments, viz. a twelve-feet reflecting teleſcope, to be divided into pieces of three feet, and joined with ſcrews. This teleſcope was alſo accompanied by two thermometers and two portable barometers. Mr Bruce moreover informed Mr Ruſſel, that he was going into a country (viz. Abyſſinia) from which few travellers had returned; and wiſhed Mr Ruſſel, or his philoſophical friends, would ſend him their deſiderata, as he was entirely at their ſervice. Mr Bruce added, that if he could not obtain admiſſion into Abyſſinia, he ſtill would do his beſt in the cauſe of ſcience on the eaſtern coaſt of the Red Sea.

As Mr Bruce had directed the inſtruments to be ready for him at Alexandria by the beginning of Auguſt 1768, it is probable that he reached Cairo about that time; from whence he proceeded to Abyſſinia, by way of JEDDA, MAZAVA, and AQUICO.

It is ſuppoſed that Mr Bruce did not continue long at Jedda, as he is ſaid to have explored the coaſt on the eaſt ſide as low as Mocha, during which drawings were taken of many curious fiſh in the Red Sea. Mr Bruce muſt alſo have entered Abyſſinia either at the latter end of 1768 or the very beginning of 1769, as he made an obſervation in that part of Africa on the 15th of January of that year.

In this perilous enterprize he was accompanied by a Greek ſervant (named *Michael*,) and an Italian painter, who probably aſſiſted in the numerous articles which might deſerve repreſentation, and who died of a flux before Mr Bruce's return to Cairo in 1773. Mr Bruce muſt at times alſo have been aſſiſted by many others, as his inſtruments, apparatus for drawings, and other neceſſaries, from their weight and bulk could not be eaſily tranſported from place to place, and perhaps required beaſts of burden. To theſe likewiſe muſt be added ſeveral medicines which enabled him to perform cures on the inhabitants, and probably occaſioned the good reception he afterwards met with.

Such other particulars as happened to Mr Bruce, during his long reſidence in this unfrequented country, muſt be left to his own ſuperior narrative; and it ſhall ſuffice, therefore, only to ſtate, that he made a large number of obſervations to fix the ſituations of places, out of which 31 have been examined and computed by the aſtronomer royal. The firſt of theſe obſervations was made on the 10th of January 1769, and the laſt on the 5th of October 1772, from 30 to 38 degrees of eaſt longitude from Greenwich, and from 12 to 28 degrees of north latitude. It need ſcarcely be ſaid, therefore, that theſe obſervations, which include ſo large an extent of almoſt unknown country, muſt prove a moſt valuable addition to geography; and the more ſo, becauſe the Portugueſe, who firſt viſited Abyſſinia, gave neither longitude nor latitude of any place in that empire; and Poncet only two latitudes, viz. thoſe of Sennar and Gieſum.

As Mr Bruce made the laſt of his obſervations on the 5th of October 1772, it is probable that he might then be on his return to Cairo, through Nubia and Upper Egypt, where he arrived on the 15th of January 1773, after an abſence of more than four years; bringing back with him his Greek ſervant, named Michael.

Mr Bruce continued at Cairo four months, during which time he had daily intercourſe with Mr Antes; the ſubſtance of a letter from whom will contain the principal confutation of Baron Tott, and others, who have been incredulous with regard to Mr Bruce's expected narrative.

Mr Antes was born of German parents, who were poſſeſſed of lands in the back ſettlements of Penſylvania; and having ſhowed early abilities as a mechanic, removed to Europe, where he diſtinguiſhed himſelf in the art of watch-making, which he learned without apprenticeſhip. Being a member of the church known by the name of *Unitas Fratrum*, and commonly called *Moravian*, he wiſhed to be employed in their miſſions, and more eſpecially that of the ſame perſuaſion eſtabliſhed at Cairo, who always have deſired to procure opportunities of inſtructing the Abyſſinians.

Mr Bruce had left Cairo fifteen months before Mr Antes came there; and the intercourſe, therefore, between them firſt took place on Mr Bruce's return in 1773.

Having given this account of Mr Bruce and Mr Antes's being firſt known to each other, we ſhall ſtate the ſubſtance of ſome information received from the latter, who is now eſtabliſhed at Fulneck near Leeds, after having reſided eleven years at Cairo.

" That Mr Bruce left Cairo in 1768, and proceeded thence by way of Jedda, Mazava, and Arquico, into Abyſſinia.

" That in 1771, a Greek came from Gondar (the capital) in Abyſſinia, who had a draught from Mr Bruce on a French merchant at Cairo (named *Roſe*) for ſome hundreds of German crowns, which were paid immediately. This draught was accompanied by a letter from Mr Bruce, and was the firſt time that he had been heard of at Cairo ſince his departure in 1768.

" That after Mr Bruce's return to Cairo in 1773, Mr Antes ſaw a young Armenian and his father (who came likewiſe from Gondar) at Mr Pini's, an Italian merchant of Cairo, where they and Mr Bruce converſed in the Abyſſinian language, and ſeemed glad to meet him again.

" That Mr Bruce returned to Cairo from Abyſſinia by way of Nubia and Upper Egypt; which can be fully atteſted by the Franciſcan friars who are eſtabliſhed at Iſne near Aſyuwan, which latter is the higheſt town of Upper Egypt.

" That during Mr Bruce's ſtay at Cairo, which was not leſs than four months, no day paſſed without their ſeeing each other; which gave Mr Antes frequent opportunities of inquiring with regard to Abyſſinia, concerning which he was particularly intereſted from a reaſon before ſtated.

" That Mr Antes likewiſe frequently converſed with Michael, Mr Bruce's Greek ſervant; who is ſtated to have by no means had a lively imagination, and who always agreed with the circumſtances mentioned by his maſter, and more particularly in relation to their having viſited the ſources of the Nile; which the Baron Tott doubts of, from having had a converſation with this ſame Greek ſervant.

Mr Antes adds, " That Baron Tott ſtaid but a few days at Cairo; and, from his ſhort reſidence in that country, hath given ſeveral erroneous accounts relative to Egypt. Mr Antes, on the other hand, had almoſt daily converſations with Michael for ſeveral years, and often in relation to the ſources of the Nile."

Laſtly, " That after Mr Bruce left Cairo, Mr Antes had converſed with others who had known Mr Bruce in Abyſſinia, and that he was there called *Maalim Jakube*, or Mr James."

After this ſtate of facts, it is conceived that no one can entertain a reaſonable doubt with regard to Mr Bruce's not only having viſited, but reſided long in Abyſſinia; though it is remarkable that the Jeſuits expreſſed the ſame doubts in relation to Poncet, who had continued there nearly as long as Mr Bruce. Poncet happened to be a layman; and the Jeſuits, perhaps, would not approve of any narrative that did not come from father Benevent, who accompanied Poncet to Abyſſinia, but unfortunately died there (*a*).

Driven, however, from this hold, the objectors will poſſibly retain their incredulity as to many particulars to be related.

The firſt of theſe is, the having viſited the ſources of the Nile; " which, from claſſical education, we cannot eaſily believe, as they were unknown to the ancients, though they had ſo great curioſity with regard to this diſcovery."

Many things, however, have been accompliſhed by travellers in modern times, which the ancients never could atchieve, and which may be attributed to their want of enterpriſe (as travellers at leaſt), of languages, and laſtly the not being able to procure credit when in a diſtant country. Mr Bruce could not have continued ſo long as he did in Abyſſinia, unleſs he had drawn from Gondar upon a merchant eſtabliſhed at Cairo.

The difficulty, however, with regard to reaching the ſources of the Nile, ariſes principally from the uncivilized ſtate of Abyſſinia, unleſs the traveller hath a proper introduction (*b*). When once this is procured, all difficulties ſeem to ceaſe, as we find by Lobo's (*c*) account of this ſame diſcovery, and likewiſe by Pon-

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(*a*) It muſt be admitted, however, that we owe to the zeal of the Jeſuits the beſt accounts we have both of China and Paraguay. Few laymen have been actuated ſo ſtrongly for the promotion of geography and ſcience as Mr Bruce; and we muſt therefore (upon the order of Jeſuits being aboliſhed) look up chiefly to the miſſionaries from the church of the Unitas Fratrum, who, though differing ſo totally in other reſpects, ſeem to have an equal ardour with the Jeſuits for inſtructing the inhabitants of countries unfrequented by Europeans. Such miſſions are already eſtabliſhed in Weſt Greenland, the coaſt of Labrador, N. Lat. 56. the back ſettlements of Carolina and Penſylvania, in India, Bengal, and the Nicobar iſlands. Thoſe eſtabliſhed on the coaſt of Labrador ſend over yearly meteorological Journals, which are communicated to the Royal Society. As for the diſpute between Poncet and Maillet the French conſul at Cairo, ſee Mod. Univ. Hiſt. vol. 6.

(*b*) The profeſſing the knowledge of medicine was Poncet's introduction, and ſeems to have been that of Mr Bruce. Even in our own civilized country, how are quacks and mountebanks reſorted to? And what an impreſſion muſt Mr Bruce, with his magnificent and ſcientific apparatus, have made upon the inhabitants of ſuch a country as Abyſſinia?

(*c*) In father Telles's compilation. See alſo Ludolf, who deſcribes the ſources from Gregory, who was a native of Abyſſinia. Father Payz was the firſt who viſited them, A. D. 1622. His account of this is ſaid to be in the archives cet's narrative, who was prevented by illneſs from viſiting the very ſpot, but hath given an ample relation from an Abyſſinian who had often been there. Poncet, moreover, had obtained leave from the emperor to make this journey, which he ſtates as not being a diſtant one, and that the emperor hath a palace near the very ſources.

If it be doubted whether Mr Bruce hath viſited every ſource of the Nile, it may be anſwered, that perhaps no Engliſhman hath taken this trouble with regard to the ſources of the Thames, which, like moſt other great rivers, is probably derived from many ſprings and rills in different directions.

The other objection which we have often heard, is, "That Mr Bruce hath mentioned in converſation, that the Abyſſinians cut a ſlice from the living ox, eſteeming it one of their greateſt delicacies."

This ſort of dainty, indeed, is not ſo conſidered in other parts of the globe; but every nation almoſt hath its peculiarities in the choice of their food. Do not we eat raw oyſters within a ſecond of their being ſeparated from the ſhell? And do not we roaſt both them and lobſters whilſt alive; the barbarity of which practice ſeems to equal that of the Abyſſinians? Do not cooks ſkin eels whilſt alive? And do not epicures crimp fiſh for the gratification of their appetites?

That the Abyſſinians eat beef in a raw ſtate, is agreed both by Lobo and Poncet; and the former ſays, *reeking* from the beaſt. Mr Antes, moreover, was told by a Franciſcan monk, who went with the caravan from Abyſſinia to Cairo (*d*), that he was witneſs of an ox being killed, and immediately devoured by the band of travellers.

One reaſon, perhaps, for this uſage may be, the great heat of the climate, which will not permit meat to be kept a ſufficient time to make it tender (as with us); and it is generally allowed, that a fowl, dreſſed immediately after it is killed, is in better order for eating than if it is kept four and twenty hours.

Is it therefore extraordinary, that an Abyſſinian epicure may really find (or perhaps fancy) that a piece cut from the beaſt whilſt alive, may be more tender, or have a better reliſh, than if it is previouſly killed by the butcher? To this may be added, that according to the information which has been received on this head, Mr Bruce's account of this practice is much miſrepreſented by the objectors, who ſuppoſe that the ox lives a conſiderable time after theſe pieces are cut from it. When theſe dainty bits, however, have been ſent to the great man's table (and which are probably taken from the fleſhy parts), the beaſt ſoon afterwards expires, when the firſt artery is cut, in providing ſlices for the numerous attendants.

Upon the whole, the not giving credit to a traveller, becauſe he mentions an uſage which is very different from ours (and is undoubtedly very barbarous), ſeems rather to argue ignorance than acuteneſs.

This brings to recollection the incredulity which was ſhown to another diſtinguiſhed traveller, Dr Shaw; who having mentioned, in an Oxford common room, that ſome of the Algerines were fond of lion's fleſh, never could obtain any credit afterwards from his brother-fellows of the ſame college, though many of them were learned men. It is well known, however, though Dr Shaw ſtates this ſame circumſtance in the publication of his travels, that he is cited with the greateſt approbation in almoſt every part of Europe. Sir William Temple ſomewhere mentions, that a Dutch governor of Batavia, who lived much with one of the moſt conſiderable inhabitants of Java, could never obtain any credit from him after having mentioned, that in Holland water became a ſolid body. The traveller who firſt ſaw a flying fiſh probably told every one of this extraordinary circumſtance as ſoon as he ſet his foot on ſhore, and was probably diſcredited with regard to the other particulars of his voyage.

The natural cauſe and progreſs of the incredulity which a traveller generally experiences, ſeems to be the following:

When he returns from a diſtant and little frequented country, every one is impatient to hear his narrative; from which, of courſe, he ſelects the more ſtriking parts, and particularly the uſages which differ moſt from our own. Some of the audience, diſbelieving what the traveller hath mentioned, put queſtions to him which ſhow their diſtruſt. The traveller by this treatment becomes irritated, and anſwers ſome of them peeviſhly, others ironically, of which the interrogators afterwards take advantage to his prejudice. Nothing is more irritating to an ingenuous perſon than to find his aſſertions are diſbelieved. This is commonly experienced in the croſs examinations of almoſt every witneſs. To the diſtreſſes of the traveller on his return, we may add, the being often teaſed by very ignorant queſtions.

ABYSSINIAN, in eccleſiaſtical hiſtory, is uſed as the name of a ſect, or hereſy, in the Chriſtian church, eſtabliſhed in the empire of Abyſſinia. The Abyſſinians are a branch of the Copts or Jacobites; with whom they agree in admitting but one nature in Jeſus Chriſt, and rejecting the council of Chalcedon; whence they are alſo called Eutychians, and ſtand oppoſed to the Melchites. They are only diſtinguiſhed from the Copts, and other ſects of Jacobites, by ſome peculiar national uſages.—The Abyſſinian ſect or church is governed by a biſhop or metropolitan ſtyled *Abuna*, ſent them by the Coptic patriarch of Alexandria reſiding at Cairo, who is the only perſon that ordains prieſts. The next dignity is that of Komos, or Hegumenas, who is a kind of arch-preſbyter. They have canons alſo, and monks: the former of whom marry; the latter, at their admiſſion, vow celibacy, but with a reſervation: theſe, it is ſaid, make a promiſe aloud, before their ſuperior, to keep chaſtity; but add, in a low voice, *as you keep it*. The emperor has a kind of ſupremacy in eccleſiaſtical matters. He alone

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archives of the College *de propaganda fide* at Rome. It is believed that there are many other curious particulars for the illuſtration of geography to be found in the ſame depoſitory. Dr Shaw mentions, moreover, ſome papers of Lippi (who accompanied the French embaſſy into Abyſſinia, A. D. 1704), which are to be found in the botanical library at Oxford.

(*d*) This points out another channel by which a traveller of enterpriſe may viſit Abyſſinia.

alone takes cogniſance of all eccleſiaſtical cauſes, except ſome ſmaller ones reſerved to the judges; and confers all benefices, except that of Abuna.—The Abyſſinians have at different times expreſſed an inclination to be reconciled to the ſee of Rome; but rather out of intereſt of ſtate than any other motive. The emperor David, or the queen regent on his behalf, wrote a letter on this head to pope Clement VII. full of ſubmiſſion, and demanding a patriarch from Rome to be inſtructed by: which being complied with, he publicly abjured the doctrine of Eutychius and Dioſcorus in 1626, and allowed the ſupremacy of the pope.—Under the emperor Sultan Seghed all was undone again; the Romiſh miſſionaries ſettled there had their churches taken from them, and their new converts baniſhed or put to death. The congregation *de propaganda* have made ſeveral attempts to revive the miſſion, but to little purpoſe.—The doctrines and ritual of this ſectary form a ſtrange compound of Judaiſm, Chriſtianity, and ſuperſtition. They practiſe circumciſion; and are ſaid to extend the practice to the females as well as males: They obſerve both Saturday and Sunday ſabbaths: they eat no meats prohibited by the law of Moſes: women are obliged to the legal purifications: and brothers marry their brothers wives, *&c.* On the other hand, they celebrate the epiphany with peculiar feſtivity, in memory of Chriſt's baptiſm; when they plunge and ſport in ponds and rivers; which has occaſioned ſome to affirm that they were baptized anew every year. Among the ſaints-days is one conſecrated to Pilate and his wife; by reaſon Pilate waſhed his hands before he pronounced ſentence on Chriſt, and his wife deſired him to have nothing to do with the blood of that juſt perſon. They have four lents: the great one commences ten days earlier than ours, and is obſerved with much ſeverity, many abſtaining therein even from fiſh, becauſe St. Paul ſays there is one kind of fleſh of men, and another of fiſhes. They allow of divorce, which is eaſily granted among them, and by the civil judge; nor do their civil laws prohibit polygamy itſelf. They have at leaſt as many miracles and legends of ſaints as the Romiſh church; which proved no ſmall embarraſſment to the Jeſuit miſſionaries, to whom they produced ſo many miracles, wrought by their ſaints, in proof of their religion, and thoſe ſo well circumſtantiated and atteſted, that the Jeſuits were obliged to deny miracles to be any proof of a true religion; and in proof hereof to allege the ſame arguments againſt the Abyſſinians, which Proteſtants in Europe allege againſt Papiſts. They pray for the dead, and invoke ſaints and angels; have ſo great a veneration for the virgin, that they charged the Jeſuits with not rendering her honour enough. Images in painting they venerate; but abhor all thoſe in relievo, except the croſs. They hold that the ſoul of man is not created; becauſe, ſay they, God finiſhed all his work on the ſixth day. They admit the apocryphal books, and the canons of the apoſtles, as well as the apoſtolical conſtitutions, for genuine. Their liturgy is given by Alvarez, and in Engliſh by Pagit.

ACA, ACE, or ACON, a town of Phœnicia, on the Mediterranean; afterwards called *Ptolemais;* now *Acre.*

ACACALOTL, the Braſilian name of a bird called by ſome *corvus aquaticus*, or the water-raven: properly, the pelicanus carbo, or corvorant. See PELICANUS.

ACACIA, EGYPTIAN THORN, or BINDING BEAN-TREE, in botany, a ſpecies of Mimoſa, according to Linnæus; tho' other botaniſts make it a diſtinct genus. See MIMOSA.

The flowers of a ſpecies of the *acacia* are uſed by the Chineſe in making that yellow, which we ſee bears waſhing in their ſilks and ſtuffs, and appears with ſo much elegance in their painting on paper. The method is this:

They gather the flowers before they are fully open; theſe they put into a clean earthen veſſel over a gentle heat, and ſtir them continually about, as they do the tea-leaves, till they become dryiſh and of a yellow colour; then to half a pound of the flowers they add three ſpoonfuls of fair water, and after that a little more, till there is juſt enough to hold the flowers incorporated together: they boil this for ſome time, and the juice of the flowers mixing with the water, it becomes thick and yellow; they then take it from the fire, and ſtrain it through a piece of coarſe ſilk. To the liquor they add half an ounce of common alum, and an ounce of calcined oyſter-ſhells reduced to a fine powder. All is then well mixed together; and this is the fine laſting yellow they have ſo long uſed.

The dyers of large pieces uſe the flowers and ſeeds of the *acacia* for dying three different ſorts of yellow. They roaſt the flowers, as before obſerved; and then mix the ſeeds with them, which muſt be gathered for this purpoſe when full ripe: by different admixture of theſe, they give the different ſhades of colour, only for the deepeſt of all they give a ſmall mixture of Brazil wood.

Mr. Geoffroy attributes the origin of bezoar to the ſeeds of this plant: which being brouſed by certain animals, and vellicating the ſtomach by their great ſourneſs and aſtringency, cauſe a condenſation of the juices, till at length they become coated over with a ſtony matter, which we call BEZOAR.

Falſe ACACIA. See ROBINIA.

Three-thorned ACACIA, or *Honey-locuſt.* See GLEDISTIA.

ACACIA, in the Materia Medica, the inſpiſſated juice of the unripe fruit of the *MIMOSA Nilotica.*

This juice is brought from Egypt, in roundiſh maſhes, wrapt up in thin bladders. It is outwardly of a deep brown colour, inclining to black; inwardly of a reddiſh or yellowiſh brown; of a firm conſiſtence, but not very dry. It ſoon ſoftens in the mouth, and diſcovers a rough, not diſagreeable taſte, which is followed by a ſweetiſh reliſh. This inſpiſſated juice entirely diſſolves in watery liquors; but is ſcarce ſenſibly acted on by rectified ſpirit.

Acacia is a mild aſtringent medicine. The Egyptians give it in ſpitting of blood, in the quantity of a dram, diſſolved in any convenient liquor; and repeat this doſe occaſionally: they likewiſe employ it in collyria for ſtrengthening the eyes, and in gargariſms for quinſeys. Among us, it is little otherwiſe uſed than as an ingredient in mithridate and theriaca, and is rarely met with in the ſhops. What is uſually ſold for the Egyptian acacia, is the inſpiſſated juice of unripe ſloes: this is harder, heavier, of a darker colour, and ſomewhat ſharper taſte, than the true ſort. See the next article.

German ACACIA, the juice of unripe ſloes inſpiſſated nearly to dryneſs over a gentle fire, care being taken to prevent its burning. It is moderately aſtringent, ſimilar to the Egyptian acacia, for which it has been commonly ſubſtituted in the ſhops. It is given in fluxes, and other diſorders where ſtyptic medicines are indicated, from a ſcruple to a dram.

Acacia, among antiquaries, ſomething reſembling a roll or bag, ſeen on medals, as in the hands of ſeveral conſuls and emperors. Some take it to repreſent a handkerchief rolled up, wherewith they made ſignals at the games; others, a roll of petitions or memorials; and ſome, a purple bag full of earth, to remind them of their mortality.

ACACIANS, in eccleſiaſtical hiſtory, the name of ſeveral ſects of heretics; ſome of which maintained, that the Son was only a ſimilar, not the ſame, ſubſtance with the Father; and others, that he was not only a diſtinct, but a diſſimilar, ſubſtance. Two of theſe ſects had their denomination from Acacius biſhop of Cæſarea, who lived in the fourth century, and changed his opinions, ſo as, at different times, to be head of both. Another was named from Acacius patriarch of Conſtantinople, who lived in the cloſe of the fifth century.

ACACIUS, ſirnamed Luscus, becauſe he was blind of one eye, was biſhop of Cæſarea in Paleſtine, and ſucceeded the famous Euſebius: he had a great ſhare in the baniſhment of pope Liberius, and bringing Felix to the ſee of Rome. He gave name to a ſect, and died about the year 365. He wrote the life of Euſebius, and ſeveral other works.

Acacius (St.), biſhop of Amida, in Meſopotamia, in 420, was diſtinguiſhed by his piety and charity. He ſold the plate belonging to his church, to redeem ſeven thouſand Perſian ſlaves, who were ready to die with want and miſery; and giving each of them ſome money, ſent them home. Veranius, their king, was ſo affected with this noble inſtance of benevolence, that he deſired to ſee the biſhop; and this interview procured a peace between that prince and Theodoſius I.

There have been ſeveral other eminent perſons of the ſame name: particularly, A martyr under the emperor Decius: A patriarch of Antioch, who ſucceeded Baſil in 458, and died in 459: A biſhop of Miletum in the fifth century: A famous rhetorician in the reign of the emperor Julian: and, A patriarch of Conſtantinople in the fifth century; who was ambitious to draw the whole power and authority of Rome by degrees to Conſtantinople, for which he was delivered over irretrievably to the devil by pope Felix III.

ACAD, or Achad, (anc. geog.) the town in which Nimrod reigned, called *Archad* by the ſeventy; ſituated in Babylonia, to the eaſtward of the Tigris.

ACADEMICIAN, or Academist, a member of an academy. See Academy in a modern ſenſe.

ACADEMICS, or Academists, a denomination given to the cultivators of a ſpecies of philoſophy originally derived from Socrates, and afterwards illuſtrated and enforced by Plato, who taught in a grove near Athens, conſecrated to the memory of Academus, an Athenian hero; from which circumſtance this philoſophy received the name of *academical*. Before the days of Plato, philoſophy had in a great meaſure fallen into contempt. The contradictory ſyſtems and hypotheſes which had ſucceſſively been urged upon the world, were become ſo numerous, that from a view of this inconſtancy and uncertainty of human opinions, many were led to conclude, that truth lay beyond the reach of our comprehenſion. Abſolute and univerſal ſcepticiſm was the natural conſequence of this concluſion. In order to remedy this abuſe of philoſophy and of the human faculties, Plato laid hold of the principles of the academical philoſophy; and, in his Phædo, reaſons in the following manner. “If we are unable to diſcover truth (ſays he), it muſt be owing to two circumſtances: either there is no truth in the nature of things; or the mind, from a defect in its powers, is not able to apprehend it. Upon the latter ſuppoſition, all the uncertainty and fluctuation in the opinions and judgments of mankind admit of an eaſy ſolution:—Let us therefore be modeſt, and aſcribe our errors to the real weakneſs of our own minds, and not to the nature of things themſelves. Truth is often difficult of acceſs: in order to come at it, we muſt proceed with caution and diffidence, carefully examining every ſtep; and, after all our labour, we will frequently find our greateſt efforts diſappointed, and be obliged to confeſs our ignorance and weakneſs.”

Labour and caution in their reſearches, in oppoſition to raſh and haſty deciſions, were the diſtinguiſhing characteriſtics of the diſciples of the ancient academy. A philoſopher, poſſeſſed of theſe principles, will be ſlow in his progreſs; but will ſeldom fall into errors, or have occaſion to alter his opinion after it is once formed. Vanity and precipitance are the great ſources of ſcepticiſm: Hurried on by theſe, inſtead of attending to the cool and deliberate principles recommended by the academy, ſeveral modern philoſophers have plunged themſelves into an abſurd and ridiculous kind of ſcepticiſm. They pretend to diſcredit ſubjects that are plain, ſimple, and eaſily comprehended; but give peremptory and deciſive judgments upon things that evidently exceed the limits of our capacity. Of theſe, Berkley and Hume are the moſt conſiderable. Berkley denied the exiſtence of every thing, excepting his own ideas. Mr. Hume has gone a ſtep farther, and queſtioned even the exiſtence of ideas; but at the ſame time has not heſitated to give determined opinions with regard to eternity, providence, and a future ſtate, miraculous interpoſitions of the Deity, &c. ſubjects far above the reach of our faculties. In his eſſay on the academical or ſceptical philoſophy, he has confounded two very oppoſite ſpecies of philoſophy. After the days of Plato, indeed, the principles of the firſt academy were groſsly corrupted by Arceſilaus, Carneades, &c. This might lead Mr. Hume into the notion that the *academical* and *ſceptical* philoſophy were ſynonimous terms. But no principles can be of a more oppoſite nature than thoſe which were inculcated by the old academy of Socrates and Plato, and the ſceptical notions which were propagated by Arceſilaus, Carneades, and the other diſciples of the ſucceeding academics.

ACADEMY, in antiquity, a garden, villa, or grove, ſituated within a mile of Athens, where Plato and his followers held their philoſophical conferences. It took its name from one Academus, or Ecademus, who was the original owner of it, and made it a kind of gymnaſium: he lived in the time of Theſeus; and, after his death, it retained his name, and was conſecrated to his memory. Cimon embelliſhed it with fountains, trees, and walks; but Sylla, during the ſiege of Athens, employed theſe very trees in making battering engines againſt the city. Cicero too had his villa, or place of retirement, near Puzzuoli, which he alſo named an *academy*, where he compoſed his *Academical queſtions*, and his book *De natura deorum*.

ACADEMY, among the moderns, is moſt commonly uſed to ſignify a SOCIETY of learned men, eſtabliſhed for the improvement of any art or ſcience, and generally under the protection of a prince.

The firſt Academy we read of, was eſtabliſhed by Charlemagne, at the inſtigation of ALCUIN. It was compoſed of the chief wits of the court, the emperor himſelf being a member. In their academical conferences, every perſon was to give an account of what ancient authors he had read; and each even aſſumed the name of ſome ancient author who pleaſed him moſt, or ſome celebrated perſon of antiquity. Alcuin, from whoſe letters we learn theſe particulars, took that of Flaccus, the ſirname of Horace: a young lord, named Augilbert, took that of Homer: Adelard, biſhop of Gorbie, was called Auguſtin: Riculfe, biſhop of Mentz, was Dametas; and the king himſelf, David. This ſhows the miſtake of ſome modern writers, who relate, that it was in conformity with the genius of the learned men of thoſe times, who were great admirers of Roman names, that Alcuin took the name of Flaccus Albinus.

Moſt nations have now their academies; but Italy has the greateſt number.—The French have many flouriſhing academies, moſt of which were eſtabliſhed by Louis XIV.—There are but few in Britain; and thoſe of chiefeſt note go by a different name. See the article SOCIETY.

In giving an account of the principal Academies, it ſeems moſt proper to arrange them according to their ſubjects.

I. *MEDICAL Academies*, as that of the Naturæ Curioſi in Germany; that founded at Palermo in 1645; another at Venice in 1701, which meets weekly in a hall near the grand hoſpital; another at Geneva in 1715, in the houſe of M. Le Clerc. The colleges of phyſicians at London and Edinburgh are alſo, by ſome, ranked in the number of *Academies*.

The Academy of *Naturæ Curioſi*, called alſo the Leopoldine Academy, was founded in 1652 by Jo. Laur. Bauſchius, a phyſician; who, in imitation of the Engliſh, publiſhed an invitation to all phyſicians to communicate their extraordinary caſes; and, meeting with ſucceſs, was elected preſident. Their works were at firſt publiſhed ſeparately; but in 1670 a new ſcheme was laid for publiſhing a volume of obſervations every year. The firſt volume appeared in 1684, under the title of Ephemerides, and the work has been continued with ſome interruptions and variations of the title, *&c.* In 1687, the emperor Leopold took the ſociety under his protection, granting the members ſeveral privileges, particularly that their preſidents ſhould be counts palatine of the holy Roman empire. This academy has no fixed reſidence, nor regular aſſemblies: inſtead of theſe, there is a kind of bureau, or office, firſt eſtabliſhed at Breſlau, and afterwards removed to Nuremberg, where letters, obſervations, *&c.* from correſpondents or members are taken in. The academy conſiſts of a preſident, two adjuncts or ſecretaries, and colleagues or members without reſtriction. The colleagues, at their admiſſion, oblige themſelves to two things: firſt, to chooſe ſome ſubject out of the animal, vegetable, or mineral kingdom, to handle, provided it had not been treated of by any colleague before; the ſecond, to apply themſelves to furniſh materials for the Annual Ephemerides. Each member to wear a ſymbol of the academy; *viz.* a gold ring; whereon, inſtead of a ſtone, is a book open, and, on the face thereof, an eye; on the other ſide the motto of the academy, *Nunquam otioſus*.

II. *CHIRURGICAL Academies*; as that inſtituted ſome years ago, by public authority, at Paris: the members of which were not only to publiſh their own and correſpondents obſervations and improvements; but to give an account of all that is publiſhed on ſurgery, and to compoſe a complete hiſtory of the art, by their extracts from all the authors ancient and modern who have wrote on it. A queſtion in ſurgery is annually propoſed by the academy, and a gold medal of 200 livres value given to him who furniſhes the moſt ſatisfactory anſwer.

Academy of Surgery at Vienna, was inſtituted ſome years ago by the preſent emperor, under the direction of the celebrated Brambilla. In this there were at firſt only two profeſſors; and to their charge the inſtruction of 130 young men was committed, 30 of whom had formerly been ſurgeons in the army. But of late the number both of the teachers and pupils has been conſiderably increaſed. Gabrieli has been appointed to teach pathology and practice; Boecking, anatomy, phyſiology, and phyſics; Streit, medical and pharmaceutical ſurgery; Hunczowſky, ſurgical operations, midwifery, and the chirurgia forenſis; and Plenk, chemiſtry and botany. To theſe alſo has been added, Beindl, as profeſſor and extraordinary profeſſor of ſurgery and anatomy. Beſides this, the emperor, with his uſual liberality, has provided a large and ſplendid edifice in Vienna, which affords habitation both for the teachers, the ſtudents, pregnant women, patients for clinical lectures, and ſervants. He has alſo purchaſed for the uſe of this academy a medical library, which is open every day; a complete ſet of chirurgical inſtruments; an apparatus for experiments in natural philoſophy; a collection of natural hiſtory; a number of anatomical and pathological preparations; a collection of preparations in wax brought from Florence; and a variety of other uſeful articles. Adjoining to the building alſo there is a good botanical garden.

Among other parts of this inſtitution, three prize-medals, each of the value of 40 florins, are to be annually beſtowed on thoſe ſtudents who return the beſt anſwer to queſtions propoſed the year before. Theſe prizes are not entirely founded by the emperor, but are in part owing to the liberality of Brendellius the protochirurgus at Vienna.

III. *ECCLESIASTICAL Academies*; as that of Bologna in Italy, inſtituted in 1687, employed in the examination of the doctrine, diſcipline, and hiſtory, of each age of the church.

IV. *COSMOGRAPHICAL Academies*; as that at Venice, called the *Argonauts*. This was inſtituted at the ſolicitation of F. Coronelli, for the improvement of geographical knowledge. Its deſign was to publiſh exact maps, both celeſtial and terreſtrial, as well particular as general, together with geographical, hiſtorical, and aſtronomical deſcriptions. Each member, in order to defray the expence of ſuch a publication, was to ſubſcribe a proportional ſum, for which they were to receive one or more copies of each piece publiſhed. For this end three ſocieties are ſettled; one under F. Moro, provincial of the minorities in Hungary; another under the abbot Laurence au Rue Payenne au Marais; the third under F. Baldigiani, Jeſuit, profeſſor of mathematics in the Roman college. The device of this academy is the terraqueous globe, with the motto *Plus ultra*; and at its expence all the globes, maps, and geographical writings of F. Coronelli, have been publiſhed.

V. *Academies of* SCIENCES.—Theſe comprehend ſuch as are erected for improving natural and mathematical knowledge. They are otherwiſe called *Philoſophical* and *Phyſical* academies.

The firſt of theſe was inſtituted at Naples, about the year 1560, in the houſe of Baptiſta Porta. It was called the Academy *Secretorum Naturæ;* and was ſucceeded by the Academy of *Lyncei,* founded at Rome by Prince Frederic Ceſi, towards the end of that century. Several of the members of this academy rendered it famous by their diſcoveries; among theſe was the celebrated Galileo. Several other academies were inſtituted about that time, which contributed greatly to the advancement of the ſciences; but none of them comparable to that of the *Lyncei.*

Some years after the death of Toricelli, the *Academy del Cimento* made its appearance, under the protection of Prince Leopold, afterwards Cardinal de Medicis. Redi was one of its chief members; and the ſtudies purſued by the reſt may be collected from thoſe curious experiments publiſhed in 1667, by their ſecretary Count Laurence Magulotti, under the title of *Saggi di Naturali Eſperienze;* a copy of which was preſented to the Royal Society, tranſlated into Engliſh by Mr Waller, and publiſhed at London in 4to.

The *Academy degl' Inquieti,* afterwards incorporated into that of Della Tracia in the ſame city, followed the example of that of Del Cimento. Some excellent diſcourſes on phyſical and mathematical ſubjects, by Geminiano Montenari, one of the chief members, were publiſhed in 1667, under the title of *Perſieri Fiſico Matematici.*

The *Academy of Roſſano,* in the kingdom of Naples, was originally an academy of Belles Letters, founded in 1540, and transformed into an Academy of Sciences in 1695 at the ſolicitation of the learned abbot Don Giacinto Gimma; who being made preſident, under the title of Promoter General thereof, gave them a new ſet of regulations. He divided the academiſts into the following claſſes: Grammarians, Rhetoricians, Poets, Hiſtorians, Philoſophers, Phyſicians, Mathematicians, Lawyers, and Divines, with a claſs apart for Cardinals and perſons of quality. To be admitted a member, a man muſt have ſome degrees in the faculty. The members are not allowed to take the title of *Academiſts* in the beginning of their books, without a written permiſſion from their preſident, which is not granted till the work has been examined by the cenſors of the academy; and the permiſſion is the greateſt honour the academy can confer, as they thereby adopt the work, and are anſwerable for it againſt all criticiſms that may be made upon it. To this law the preſident or promoter himſelf is ſubject; and no academiſt is allowed to publiſh any thing againſt the writings of another without leave from the ſociety.

Several other Academies of *Sciences* have been founded in Italy; but, for want of being ſupported by princes, did not continue long. The loſs of them, however, was abundantly repaired by the inſtitution of others ſtill ſubſiſting; ſuch as, the *Academy of Filarmonici* at Verona; of *Ricovatri* at Padua, where a learned diſcourſe on the origin of ſprings was delivered by Sig. Valliſnieri, firſt profeſſor of phyſic in the univerſity of that city, and which was afterwards printed. To the Academy of the *Muti de Riggio,* at Modena, the ſame Sig. Valliſnieri preſented an excellent diſcourſe on the ſcale of created beings, ſince inſerted in his hiſtory of the generation of man and animals printed at Venice in the year 1721.

F. Merſenne is ſaid to have given the firſt idea of a philoſophical academy in France, towards the beginning of the 17th century, by the conferences of naturaliſts and mathematicians occaſionally held at his lodgings; at which Gaſſendi, Des Cartes, Hobbes, Roberval, Paſcal, Blondel, and others aſſiſted. F. Merſenne propoſed to each certain problems to examine, or certain experiments to be made. Theſe private aſſemblies were ſucceeded by more public ones, formed by Mr Montmort, and Mr Thevenot the celebrated traveller. The French example animated ſeveral Engliſhmen of diſtinction and learning to erect a kind of philoſophical academy at Oxford, towards the cloſe of Oliver Cromwell's adminiſtration; which, after the Reſtoration, was erected into a Royal Society. See SOCIETY. The Engliſh example, in its turn, animated the French. Lewis XIV. in 1666, aſſiſted by the counſels of Mr Colbert, founded an academy of ſciences at Paris, with a ſufficient revenue to defray the charge of experiments, and ſalaries to the members.

Royal Academy of Sciences. After the peace of the Pyrenees, Lewis XIV. being deſirous of eſtabliſhing the arts, ſciences, and literature, upon a ſolid foundation, directed M. Colbert to form a ſociety of men of known abilities and experience in the different branches, who ſhould meet together under the king's protection, and communicate their reſpective diſcoveries. Accordingly Mr Colbert, having conferred with thoſe who were at that time moſt celebrated for their learning, reſolved to form a ſociety of ſuch perſons as were converſant in natural philoſophy and mathematics, to join to them other perſons ſkilled in hiſtory and other branches of erudition, along with thoſe who were entirely engaged in what are called the *Belles Lettres,* grammar, eloquence, and poetry. The geometricians and natural philoſophers were ordered to meet on Tueſdays and Saturdays, in a great hall of the king's library, where the books of mathematics and natural philoſophy were contained; the learned in hiſtory to aſſemble on Mondays and Thurſdays, in the hall where the books of hiſtory are contained; and the claſs of Belles Lettres to aſſemble on Wedneſdays and Fridays. All the different claſſes were likewiſe ordered to meet together upon the firſt Thurſday of every month; and, by their reſpective ſecretaries, make a report of the proceedings of the foregoing month.

In a ſhort time, however, the claſſes of Hiſtory, Belles Letters, &c. were united to the *French* Academy, which was originally inſtituted for the improvement and refining the French language; ſo that the royal Academy contained only two claſſes, *viz.* that of natural philoſophy and mathematics.

In 1696, the king, by a proclamation dated the 26th of January, gave this Academy a new form, and put it upon a more reſpectable footing. It was now to be compoſed of four kinds of members, viz. *honorary, penſionary aſſociates*, and *eleves*. Theſe laſt were a kind of pupils, or ſcholars, each of whom was attached to one of the penſionaries. The firſt claſs to contain ten perſons, and each of the reſt twenty. The honorary academiſts to be all inhabitants of France; the penſionaries all to reſide at Paris; eight of the aſſociates allowed to be foreigners; and the eleves all to live at Paris. The officers to be, a preſident named by the king, out of the claſs of honorary academiſts; and a ſecretary and treaſurer to be perpetual. Of the penſionaries, three to be geometricians, three aſtronomers, three mechanics, three anatomiſts, three chemiſts, three botaniſts, and the remaining two to be ſecretary and treaſurer. Of the twelve aſſociates, two to apply themſelves to geometry, two to botany, and two to chemiſtry. The eleves to apply themſelves to the ſame kind of ſcience with the penſionaries they were attached to; and not to ſpeak, except when called by the preſident. No regular or religious to be admitted, except into the claſs of honorary academiſts; nor any perſon to be admitted either for aſſociate or penſionary, unleſs known by ſome conſiderable printed work, ſome machine, or other diſcovery. The aſſemblies were held on Wedneſdays and Saturdays, unleſs either of them happened to be a holiday, and then the aſſembly was held on the preceding day.—To encourage the members to purſue their labours, the king engaged not only to pay the ordinary penſions, but even to give extraordinary gratifications, according to the merit of their reſpective performances; furniſhing withal the expence of the experiments and other inquiries neceſſary to be made. If any member gave in a bill of charges of experiments he had made, or deſiring the printing of any book, and brought in the charges of graving, the money was immediately paid by the king, upon the preſident's allowing and ſigning the bill. So, if an anatomiſt required live tortoiſes, for inſtance, for making experiments about the heart, &c. as many as he pleaſed were brought him at the king's charge. Their motto was, *Invenit et perfecit.*

In the year 1716, the duke of Orleans, then regent, made an alteration in their conſtitution; augmenting the number of honoraries, and of aſſociates capable of being foreigners, to 12; admitting regulars among ſuch aſſociates; and ſuppreſſing the claſs of eleves, as it appeared to be attended with ſome inconveniences, particularly that of making too great an inequality among the academiſts, and being productive of ſome miſunderſtandings and animoſities among the members. At the ſame time he created other two claſſes; one conſiſting of 12 adjuncts, who, as well as the aſſociates, were allowed a deliberative voice in matters relative to ſcience; and the other ſix free aſſociates, who were not attached to any particular ſcience, nor obliged to purſue any particular work.

Since its re-eſtabliſhment in 1696, this academy has been very exact in publiſhing, every year, a volume containing either the works of its own members, or ſuch memoirs as have been compoſed and read to the academy during the courſe of that year. To each volume is prefixed the hiſtory of the academy, or an extract of the memoirs, and, in general, of whatever has been read or ſaid in the academy; at the end of the hiſtory, are the eulogiums on ſuch academiſts as have died that year.—M. Rouille de Meſlay, counſellor to the parliament of Paris, founded two prizes, one of 2500, and the other of 2000 livres, which are alternately diſtributed by the parliament every year: the ſubject for the firſt muſt relate to phyſical aſtronomy, and thoſe for the latter to navigation and commerce.

Notwithſtanding the advantages which the members of this academy enjoy over others, in having their expences defrayed, and even being paid for their time and attendance, they have fallen under ſome imputations, particularly that of plagiariſm, or borrowing their neighbours inventions; but with what juſtice we do not ſay.

The French have alſo conſiderable academies in moſt of their great cities: as, at Montpelier, a royal academy of ſciences on the like footing as that at Paris, being as it were a counterpart thereof; at Thoulouſe, an academy under the denomination of Lanterniſts; others at Niſmes, Arles, Lyons, Dijon, Bourdeaux, &c.

The Royal Academy of Sciences at Berlin was founded in 1700, by Frederic II. king of Pruſſia, on the model of that of England; excepting that, beſides natural knowledge, it likewiſe comprehends the Belles Lettres. In 1710, it was ordained that the preſident ſhall be one of the counſellors of ſtate, and nominated by the king. The members were divided into four claſſes; the firſt for proſecuting phyſics, medicine, and chemiſtry; the ſecond for mathematics, aſtronomy, and mechanics; the third for the German language and the hiſtory of the country; the fourth for oriental learning, particularly as it may concern the propagation of the goſpel among infidels. Each claſs to elect a director for themſelves, who ſhall hold his poſt for life. The members of any of the claſſes have free admiſſion into the aſſemblies of any of the reſt.

The great promoter of this inſtitution was the celebrated Mr Leibnitz, who accordingly was made the firſt director. The firſt volume of their tranſactions was publiſhed in 1710, under the title of *Miſcellanea Berolinenſia;* and though they received but few marks of the royal favour for ſome time, they continued to publiſh new volumes in 1723, 1727, 1734, and 1740. At laſt, however, Frederic III. the late king of Pruſſia, gave new vigour to this academy, by inviting to Berlin ſuch foreigners as were moſt diſtinguiſhed for their merit in literature, and encouraged his ſubjects to proſecute the ſtudy and cultivation of the ſciences by giving ample rewards; and thinking that the academy, which till that time had had ſome miniſter or opulent nobleman for its preſident, would find an advantage in having a man of letters at its head, he conferred that honour on M. Maupertuis. At the ſame time, he gave a new regulation to the academy, and took upon himſelf the title of its protector.

The academiſts hold two public aſſemblies annually; one in January, on the late king's birth day; and the other in May, on the day of his acceſſion to the throne. At the latter of theſe is given, as a prize, a gold medal of 50 ducats value: the ſubject for this prize is ſucceſſively, natural philoſophy, mathematics, metaphyſics, and erudition.

The Imperial Academy of Sciences at Peterſburgh was projected by Czar Peter the Great. That great monarch having, during his travels, obſerved the advantage of public ſocieties for the encouragement and promotion of literature, formed the deſign of founding an academy of ſciences at St Peterſburgh. By the advice of Wolf and Leibnitz, whom he conſulted on this occaſion, the ſociety was regulated, and ſeveral learned foreigners were invited to become members. Peter himſelf drew the plan, and ſigned it on the 10th of February 1724; but was prevented, by the ſuddenneſs of his death, from carrying it into execution. His deceaſe, however, did not prevent its completion: for on the 21ſt of December 1725, Catharine I. eſtabliſhed it according to Peter's plan; and on the 27th of the ſame month the ſociety was firſt aſſembled. On the 1ſt of Auguſt 1726, Catharine honoured the meeting with her preſence, when profeſſor Bulfinger, a German naturaliſt of great eminence, pronounced an oration upon the advances made by the loadſtone and needle for the diſcovery of the longitude.

The empreſs ſettled a fund of 4982l. *per annum* for the ſupport of the academy; and fifteen members, all eminent for their learning and talents, were admitted and penſioned, under the title of Profeſſors, in the various branches of literature and ſcience. The moſt diſtinguiſhed of theſe profeſſors were Nicholas and Daniel Bernoulli, the two De Liſles, Bulfinger, and Wolf.

During the ſhort reign of Peter II. the ſalaries of the members were diſcontinued, and the academy was utterly neglected by the court; but it was again patronized by the empreſs Anne, who even added a ſeminary for the education of youth, under the ſuperintendance of the profeſſors. Both inſtitutions flouriſhed for ſome time under the direction of Baron Korf; but upon his death, towards the latter end of Anne's reign, an ignorant perſon being appointed preſident, many of the moſt able members quitted Ruſſia. At the acceſſion of Elizabeth, new life and vigour were again reſtored to the academy: the original plan was enlarged and improved; ſome of the moſt learned foreigners were again drawn to Peterſburgh; and, what was conſidered as a good omen for the literature of Ruſſia, two natives, Lomonoſof and Rumovſky, men of genius and abilities, who had proſecuted their ſtudies in foreign univerſities, were enrolled among its members. The annual income was increaſed to 10,659l. and ſoon afterwards the new inſtitution took place.

The preſent empreſs Catharine III. with her uſual zeal for promoting the diffuſion of knowledge, has taken this uſeful ſociety under her more immediate protection. She has altered the court of directors greatly to the advantage of the whole body; ſhe has corrected many abuſes, and has infuſed a new ſpirit into their reſearches. By her Majeſty's particular recommendation, the moſt ingenious profeſſors have viſited the various provinces of her vaſt dominions; and as the fund of the academy was not ſufficient to ſupply the whole expence of theſe ſeveral expeditions, the empreſs beſtowed a largeſs of 2000l. which ſhe has renewed as occaſion has required.

The purpoſe and intent of theſe travels will appear from the inſtructions given by the academy to the ſeveral perſons who were engaged in them. They were ordered to purſue their inquiries upon the different ſorts of earths and waters; upon the beſt methods of cultivating the barren and deſart ſpots; upon the local diſorders incident to men and animals, and the moſt efficacious means of relieving them; upon the breeding of cattle, and particularly of ſheep; on the rearing of bees and ſilk-worms; on the different places and objects for fiſhing and hunting; on minerals; on the arts and trades; and on forming a Flora Ruſſica, or collection of indigenous plants: they were particularly inſtructed to rectify the longitude and latitude of the principal towns; to make aſtronomical, geographical, and meteorological obſervations; to trace the courſe of the rivers; to make the moſt exact charts; and to be very diſtinct and accurate in remarking and deſcribing the manners and cuſtoms of the different people, their dreſſes, languages, antiquities, traditions, hiſtory, religion; and, in a word, to gain every information which might tend to illuſtrate the real ſtate of the whole Ruſſian empire.

In conſequence of theſe expeditions, perhaps no country can boaſt, within the ſpace of ſo few years, ſuch a number of excellent publications on its internal ſtate, on its natural productions, on its topography, geography, and hiſtory; on the manners, cuſtoms, and languages of the different people, as have iſſued from the preſs of this academy.

The firſt tranſactions of this ſociety were publiſhed in 1728, and entitled, *Commentarii Academiæ Scientiarum Imperialis Petropolitanæ ad an.* 1726, with a dedication to Peter II. The publication was continued under this form until the year 1747, when its tranſactions were called *Novi Commentarii Academiæ*, &c. In 1777 the academy again changed the title into *Acta Academiæ Scientiarum Imperialis Petropolitanæ*, and likewiſe made ſome alteration in the arrangement and plan of the work. The papers, which had been hitherto publiſhed in the Latin tongue, are now written either in that language or French; and a preface is added, ſtyled *Partie Hiſtorique*, which contains an account of its proceedings, meetings, admiſſion of new members, and other remarkable occurrences. Of the Commentaries, 14 volumes were publiſhed: the firſt of the New Commentaries made its appearance in 1750, and the twentieth in 1776. Under the new title of *Acta Academiæ*, ſeveral volumes have been given to the public, and two are printed every year. Theſe tranſactions abound with ingenious and elaborate diſquiſitions upon various parts of ſcience and natural hiſtory, and which reflect the greateſt honour upon their authors; and it may not be an exaggeration to aſſert, that no ſociety in Europe has more diſtinguiſhed itſelf for the excellence of its publications, and particularly in the more abſtruſe parts of the pure and mixed mathematics.

The academy is ſtill compoſed, as at firſt, of fifteen profeſſors, beſide the preſident and director. Each of theſe profeſſors has a houſe and an annual ſtipend from 200l. to 600l. Beſide the profeſſors, there are four adjuncts, who are penſioned, and who are preſent at the ſittings of the ſociety, and ſucceed to the firſt vacancies.—The direction of the academy is at preſent conſigned to the Princeſs Daſhkof.

The building and apparatus of this academy are extraordinary. There is a fine library, conſiſting of 36000 curious books and manuſcripts.—There is an extenſive muſeum, in which the various branches of natural hiſtory, &c. are diſtributed in different apartments: it is extremely rich in native productions, having been conſiderably augmented with a variety of ſpecimens collected by Pallas, Gmelin, Guldenſtaedt, and other learned profeſſors, during their late expeditions through the Ruſſian empire. The ſtuffed animals and birds occupy one apartment. The chamber of rarities, the cabinet of coins, &c. contain innumerable articles of the higheſt curioſity and value. The ſociety has this modeſt motto, *Paulatim.*

The Academy of Sciences at Bologna, called the *Inſtitute of Bologna*, was founded by count Marſigli in 1712, for the cultivating of phyſics, mathematics, medicine, chemiſtry, and natural hiſtory. Its hiſtory is written by M. de Limiers, from memoirs furniſhed by the founder himſelf.

The Academy of Sciences at Stockholm, or *Royal Swediſh Academy*, owes its inſtitution to ſix perſons of diſtinguiſhed learning, amongſt whom was the celebrated Linnæus: they originally met on the 2d of June 1739, formed a private ſociety, in which ſome diſſertations were read; and in the latter end of the ſame year their firſt publication made its appearance. As the meetings continued and the members increaſed, the ſociety attracted the notice of the king, and was, on the 31ſt of March 1741, incorporated under the name of the Royal Swediſh Academy. Not receiving any penſion from the crown, it is only under the protection of the king, being directed by its own members. It has now a large fund, which has chiefly ariſen from legacies and other donations; but a profeſſor of experimental philoſophy, and two ſecretaries, are ſtill the only perſons who receive any ſalaries. Each of the members reſident at Stockholm becomes preſident by rotation, and continues in office during three months. There are two ſpecies of members, native and foreign: the election of the former is held in April, and of the latter in July: no money is paid at the time of admiſſion. The diſſertations read at each meeting are collected and publiſhed four times in the year; they are written in the Swediſh language, and printed in octavo, and the annual publications make a volume. The firſt forty volumes, which were finiſhed in 1779, are called the Old Tranſactions; for in the following year the title was changed into that of New Tranſactions. The king is ſometimes preſent at the ordinary meetings, and particularly at the annual aſſembly in April for the election of members. Any perſon who ſends a treatiſe which is thought worthy of being printed, receives the tranſactions for that quarter *gratis*, and a ſilver medal, which is not eſteemed for its value, being worth only three ſhillings, but for its rarity and the honour conveyed by it. All the papers belonging to agriculture are put forth ſeparately, under the title of *Oeconomica Acta*. Annual premiums, in money and gold medals, principally for the encouragement of agriculture and inland trade, are alſo diſtributed by the academy. The fund for theſe prizes is ſupplied from private donations.

The Royal Academy of Sciences at Copenhagen, owes its inſtitution to the zeal of ſix literati, whom Chriſtian VI. in 1742, ordered to arrange his cabinet of medals. The count of Holſtein was the firſt preſident; and the ſix perſons who firſt formed the deſign, were John Gram, Joachim Frederic Ramus, Chriſtian Louis Scheid, Mark Woldickey, Eric Pontopidan, and Bernard Moelman. Theſe perſons occaſionally meeting for that purpoſe, extended their deſigns; aſſociated with them others who were eminent in ſeveral branches of ſcience; and forming a kind of literary ſociety, employed themſelves in ſearching into, and explaining the hiſtory and antiquities of their country. The count of Holſtein warmly patroniſed this ſociety, and recommended it ſo ſtrongly to Chriſtian VI. that, in 1743, his Daniſh Majeſty took it under his protection, called it the Royal Academy of Sciences, endowed it with a fund, and ordered the members to join to their former purſuits, natural hiſtory, phyſics, and mathematics. In conſequence of the royal favour, the members engaged with freſh zeal in their purſuits; and the academy has publiſhed fifteen volumes in the Daniſh language, ſome whereof have been tranſlated into Latin.

The American Academy of Sciences, was eſtabliſhed in 1780 by the council and houſe of repreſentatives in the commonwealth of Maſſachuſetts-Bay, for promoting the knowledge of the antiquities of America, and of the natural hiſtory of the country; for determining the uſes to which its various natural productions might be applied; for encouraging medicinal diſcoveries, mathematical diſquiſitions, philoſophical inquiries and experiments, aſtronomical, meteorological, and geographical obſervations, and improvements in agriculture, manufactures, and commerce; and, in ſhort, for cultivating every art and ſcience, which may tend to advance the intereſt, honour, dignity, and happineſs, of a free, independent, and virtuous people.—The members of this academy are never to be more than 200, nor leſs than 40.

VI. *Academies or Schools of* ARTS; as that at Peterſburgh, which was eſtabliſhed by the empreſs Elizabeth, at the ſuggeſtion of count Shuvalof, and annexed to the academy of ſciences; the fund was 4000*l*. per annum, and the foundation for 40 ſcholars. The preſent empreſs has formed it into a ſeparate inſtitution, enlarged the annual revenue to 12,000*l*., and augmented the number of ſcholars to 300; ſhe has alſo conſtructed, for the uſe and accommodation of the members, a large circular building, which fronts the Neva. The ſcholars are admitted at the age of ſix, and continue until they have attained that of 18: they are clothed, fed, and lodged, at the expence of the crown. They are all inſtructed in reading and writing, arithmetic, the French and German languages, and drawing. At the age of 14 they are at liberty to chooſe any of the following arts, divided into four claſſes. 1. Painting in all its branches of hiſtory, portraits, battles, and landſcapes; architecture; Moſaic; enamelling, &c. 2. Engraving on copperplates, ſeal-cutting, &c. 3. Carving in wood, ivory, and amber. 4. Watch-making, turning, inſtrument-making, caſting ſtatues in bronze and other metals, imitating gems and medals in paſte and other compoſitions, gilding, and varniſhing. Prizes are annually diſtributed to thoſe who excel in any particular art: and from thoſe who have obtained four prizes, twelve are ſelected, who are ſent abroad at the charge of the empreſs. A certain ſum is paid to defray their travelling expences; and when they are ſetled in any town, they receive an annual ſalary of 60*l.* which is continued during four years. There is a ſmall aſſortment of paintings for the uſe of the ſcholars; and thoſe who have made great progreſs are permitted to copy the pictures in the empreſs's collection. For the purpoſe of deſign, there are models in plaſter, of the beſt antique ſtatues in Italy, all done at Rome, of the ſame ſize with the originals, which the artiſts of the academy were employed to caſt in bronze.

The Royal Academy of Arts in London, was inſtituted for the encouragement of Deſigning, Painting, Sculpture, &c. &c. in the year 1768. This academy is under the immediate patronage of the king, and under the direction of 40 artiſts of the firſt rank in their ſeveral profeſſions. It furniſhes, in winter, living models of different characters to draw after; and, in ſummer, models of the ſame kind to paint after. Nine of the ableſt academicians are annually elected out of the 40, whoſe buſineſs is to attend by rotation, to ſet the figures, to examine the performance of the ſtudents, and to give them neceſſary inſtructions. There are likewiſe four profeſſors, of *Painting*, of *Architecture*, of *Anatomy*, and of *Perſpective*, who annually read public lectures on the ſubjects of their ſeveral departments; beſide a preſident, a council, and other officers. The admiſſion to this academy is free to all ſtudents properly qualified to reap advantage from the ſtudies cultivated in it; and there is an annual exhibition of paintings, ſculptures, and deſigns, open to all artiſts of diſtinguiſhed merit.

The Academy of Painting and Sculpture at Paris. This took its riſe from the diſputes that happened between the maſter painters and ſculptors in that capital; in conſequence of which, M. Le Brun, Sarazin, Corneille, and others of the king's painters, formed a deſign of inſtituting a particular academy; and, having preſented a petition to the king, obtained an arret dated Jan. 20, 1648. In the beginning of 1655, they obtained from cardinal Mazarin a brevet, and letters patent, which were regiſtered in parliament; in gratitude for which favour, they choſe the cardinal for their protector, and the chancellor for their vice-protector. In 1663, by means of M. Colbert, they obtained a penſion of 4000 livres. The academy conſiſts of a protector; a vice-protector; a director; a chancellor; four rectors; adjuncts to the rectors; a treaſurer, four profeſſors, one of which is profeſſor of anatomy, and another of geometry; ſeveral adjuncts and councellors, an hiſtoriographer, a ſecretary and two uſhers.

The Academy of Painting holds a public aſſembly every day for two hours in the afternoon, to which the painters reſort either to deſign or to paint, and where the ſculptors model after a naked perſon. There are 12 profeſſors, each of whom keeps the ſchool for a month; and there are 12 adjuncts to ſupply them in caſe of need. The profeſſor upon duty places the naked man as he thinks proper, and ſets him in two different attitudes every week. This is what they call *ſetting the model*. In one week of the month he ſets two models together, which is called *ſetting the group*. The paintings and models made after this model, are called *academics*, or *academy-figures*. They have likewiſe a woman who ſtands for a model in the public ſchool. Every three months, three prizes for deſign are diſtributed among the *eleves* or diſciples; two others for painting, and two for ſculpture, every year.

There is alſo an Academy of Painting, Sculpture, &c. at Rome, eſtabliſhed by Lewis XIV. wherein thoſe who have gained the annual prize at Paris are intitled to be three years entertained at the king's expence, for their further improvement.

The Academy of Architecture, eſtabliſhed by M. Colbert in 1671, conſiſting of a company of ſkilful architects, under the direction of the ſuperintendant of the buildings.

The Academy of Dancing, erected by Lewis XIV. with privileges above all the reſt.

VII. *Academies of* LAW; as that famous one at Beryta, and that of the Sitientes at Bologna.

VIII. *Academies of* HISTORY; as the *Royal Academy of Portugueſe Hiſtory at Liſbon*. This academy was inſtituted by king John V. in 1720. It conſiſts of a director, four cenſors, a ſecretary, and 50 members; to each of whom is aſſigned ſome part of the eccleſiaſtical or civil hiſtory of the nation, which he is to treat either in Latin or Portugueſe. In the church-hiſtory of each dioceſe, the prelates, ſynods, councils, churches, monaſteries, academies, perſons illuſtrious for ſanctity or learning, places famous for miracles or relics, muſt be diſtinctly related in twelve chapters. The civil hiſtory compriſes the tranſactions of the kingdom from the government of the Romans down to the preſent time. The members who reſide in the country are obliged to make collections and extracts out of all the regiſters, &c. where they live. Their meetings to be once in 15 days.

A medal was ſtruck by this academy in honour of their prince: the front of which was his effigy, with the inſcription *Johannes V. Luſitanorum Rex*; and, on the reverſe, the ſame prince is repreſented ſtanding, and raiſing Hiſtory almoſt proſtrate before him, with the legend *Hiſtoria reſurges*. Underneath are the following words in abbreviature: REGia ACADemia HISToria LUSITanæ, INSTITuta VI. Idus Decembris MDCCXX.

Academy of Suabian Hiſtory at Tubingen, was lately eſtabliſhed by ſome learned men, for publiſhing the beſt hiſtorical writings, the lives of the chief hiſtorians, and compiling new memoirs, on the ſeveral points and periods thereof.

IX. *Academies of* ANTIQUITIES; as that at Cortona in Italy, and at Upſal in Sweden. The firſt is deſigned for the ſtudy of Hetrurian antiquities: the other for illuſtrating the northern languages, and the antiquities of Sweden, in which notable diſcoveries have been made by it. The head of the Hetrurian academy is called *Lucomon*, by which the ancient governors of the country were diſtinguiſhed. One of their laws is to give audience to poets only one day in the year; another is to fix their ſeſſions, and impoſe a tax of a diſſertation on each member in his turn.

The Academy of Medals and Inſcriptions at Paris was ſet on foot by M. Colbert, under the patronage of Lewis XIV. in 1663, for the ſtudy and explanation of ancient monuments, and perpetuating great and memorable events, eſpecially thoſe of the French monarchy, by coins, relievos, inſcriptions, &c. The number of members at firſt was confined to four or five, choſen out of thoſe of the French academy; who met in the library of Mr Colbert, from whom they received his majeſty's orders. The days of their meetings were not determined: but generally they met on Wedneſdays, eſpecially in the winter ſeaſon: but, in 1691, the king having given the inſpection of this academy to M. de Pontchartrain comptroller general, &c. he fixed their meetings on Tueſdays and Saturdays.

By a new regulation, dated the 16th of July 1701, the academy was compoſed of ten *honorary* members; ten *aſſociates*, each of whom had two declarative voices; ten *penſionaries*; and ten *eleves*, or pupils. They then met every Tueſday and Wedneſday, in one of the halls of the Louvre; and had two public meetings yearly, one the day after Martinmas and the other the 16th after Eaſter. The claſs of *eleves* has been ſuppreſſed, and united to the aſſociates. The king nominates their preſident and vice-preſident yearly: but their ſecretary and treaſurer are perpetual. The reſt are choſen by the members themſelves, agreeably to the conſtitutions on that behalf given them.

One of the firſt undertakings of this academy, was to compoſe, by means of medals, a connected hiſtory of the principal events of Lewis XIV's reign; but in this deſign they met with great difficulties, and of conſequence it was interrupted for many years: but at length it was completed down to the advancement of the duke of Anjou to the crown of Spain.

In this celebrated work, the eſtabliſhment of the academy itſelf was not forgot. The medal on this ſubject repreſents Mercury ſitting, and writing with an antique ſtylus on a table of braſs; he leans with his left hand upon an urn full of medals, and at his feet are ſeveral others placed upon a card: the legend, *Rerum geſtarum fides*; and on the exergue, *Academia regia inſcriptionum et numiſmatum, inſtituta* M.DC.LXIII. ſignifying that the Royal Academy of Medals and Inſcriptions, founded in 1663, ought to give to future ages a faithful teſtimony of all great actions. Beſides this work, we have ſeveral volumes of their memoirs; and their hiſtory, written and continued by their ſecretaries.

X. *Academies of* BELLES LETTRES, are thoſe wherein eloquence and poetry are chiefly cultivated. Theſe are very numerous in Italy, and not uncommon in France.

The Academy of Umidi at Florence has contributed greatly to the progreſs of the ſciences by the excellent Italian tranſlations given by ſome of its members, of the ancient Greek and Latin hiſtorians. Their chief attention is to the Italian poetry, at the ſame time that they have applied themſelves to the poliſhing of their language, which produced the *Academy del la Cruſca*.

The Academy of Humouriſts, Umoriſti, had its origin at Rome from the marriage of Lorenzo Marcini, a Roman gentleman: at which ſeveral perſons of rank were gueſts; and it being carnival time, to give the ladies ſome diverſion, they took themſelves to the reciting of verſes, ſonnets, ſpeeches, firſt *ex tempore*, and afterwards premeditately; which gave them the denomination of *Belli Humori*. After ſome experience, coming more and more into the taſte of theſe exerciſes, they reſolved to form an Academy of Belles Lettres; and changed the title of *Belli Humori* for that of *Humoriſti*: chooſing for their device a cloud, which, after being formed of exhalations from the ſalt waters of the ocean, returns in a gentle ſweet ſhower; with this motto from Lucretius, *Redit agmine dulci*.

In 1690, the *Academy of Arcadi* was eſtabliſhed at Rome, for reviving the ſtudy of Poetry and of the Belles Lettres. Beſides moſt of the politer wits of both ſexes in Italy, this academy comprehends many princes, cardinals, and other eccleſiaſtics; and, to avoid diſputes about pre-eminence, all appear maſked after the manner of Arcadian ſhepherds. Within ten years from its firſt eſtabliſhment, the number of *Academiſts* amounted to ſix hundred. They hold aſſemblies ſeven times a-year in a mead or grove, or in the gardens of ſome nobleman of diſtinction. Six of theſe meetings are employed in the recitation of poems and verſes of the Arcadi reſiding at Rome; who read their own compoſitions; except ladies and cardinals, who are allowed to employ others. The ſeventh meeting is ſet apart for the compoſitions of foreign or abſent members.

This academy is governed by a Cuſtos, who repreſents the whole ſociety, and is choſen every four years, with a power of electing 12 others yearly for his aſſiſtance. Under theſe are two ſub-cuſtodes, one vicar or pro-cuſtos, and four deputies or ſuperintendants, annually choſen. The laws of the ſociety are immutable, and bear a near reſemblance to the ancient model.

There are five manners of electing members. The firſt is by *acclamation*. This is uſed when ſovereign princes, cardinals, and ambaſſadors of kings, deſire to be admitted; and the votes are then given *viva voce*. The ſecond is called *annumeration*. This was introduced in favour of ladies and academical colonies, where the votes are taken privately. The third, *repreſentation*, was eſtabliſhed in favour of colonies and univerſities, where the young gentry are bred; who have each a privilege of recommending one or two members privately to be balloted for. The fourth, *ſurrogation*; whereby new members are ſubſtituted in the room of thoſe dead or expelled. The laſt, *deſtination*; whereby, when there is no vacancy of members, perſons of poetical merit have the title of Arcadi conferred upon them till ſuch time as a vacancy ſhall happen. All the members of this body, at their admiſſion, aſſume new paſtoral names, in imitation of the ſhepherds of Arcadia. The academy has ſeveral colonies of Arcadi in different cities of Italy, who are all regulated after the ſame manner.

XI. *Academies of* LANGUAGES; called, by ſome, *Grammatical Academies*; as,

The Academy della Cruſca at Florence, famous for its vocabulary of the Italian tongue, was formed in 1582, but ſcarce heard of before the year 1584, when it became noted for a diſpute between Taſſo and ſeveral of its members. Many authors confound this with the Florentine academy. The diſcourſes which Toricelli, the celebrated diſciple of Galileo, delivered in the aſſemblies, concerning levity, the wind, the power of percuſſion, mathematics, and military architecture, are a proof that theſe academiſts applied themſelves to things as well as words.

The Academy of Fructiferi had its riſe in 1617, at an aſſembly of ſeveral princes and nobility of the country, who met with a deſign to refine and perfect the German tongue. It flouriſhed long under the direction of princes of the empire, who were always choſen preſidents. In 1668, the number of members aroſe to upwards of 900. It was prior in time to the French academy, which only appeared in 1629, and was not eſtabliſhed into an academy before the year 1635. Its hiſtory is written in the German tongue by George Neumarck.

The French Academy, which had its riſe from a meeting of men of letters in the houſe of M. Conrart, in 1629. In 1635, it was erected into an academy, by Cardinal Richlieu, for refining and aſcertaining the French language and ſtyle. The number of its members are limited to 40; out of whom a director, chancellor, and ſecretary, are to be choſen: the two former hold their poſt for two months, the latter is perpetual. The members of this academy enjoy ſeveral privileges and immunities, among which is that of not being obliged to anſwer before any court but that of the king's houſehold. They meet three times a-week in the Louvre; at breaking up, forty ſilver medals are diſtributed among them, having on one ſide the king of France's head, and on the reverſe, *Protecteur de l'Academie*, with laurel, and this motto, *A l'Immortalité*. By this diſtribution, the attendance of the *Academiſts* is ſecured, thoſe who are preſent receiving the ſurplus otherwiſe intended for the abſent. To elect or expel a member, at leaſt 18 are required; nor can any be choſen unleſs he petition for it: by this expedient, the affront of refuſals from perſons elected is avoided. Religious are not admitted; nor can any nobleman, or perſon of diſtinction, be admitted on another footing than as a man of letters. None are to be expelled, except for baſe and diſhoneſt practices; and there are but two inſtances of ſuch expulſions, the firſt of M. Granier for refuſing to return a depoſit, the other of the Abbé Furetiere for plagiariſm.——The deſign of this academy was to give not only rules, but examples, of good writing. They began with making ſpeeches on ſubjects taken at pleaſure, about 20 of which were printed. They met with great oppoſition from the parliament at their firſt inſtitution; it being two years before the patents granted by the king would be regiſtered. They have been ſeverely ſatyrized, and their ſtyle has been ridiculed as enervating inſtead of refining the French language. They are alſo charged with having ſurfeited the world by flattery, and having exhauſted all the topics of panegyric in praiſe of their founder; it being a duty incumbent on every member, at his admiſſion, to make a ſpeech in praiſe of the king, the cardinal, the chancellor Seguier, and the perſon in whoſe place he is elected. The moſt remarkable work of this academy is a dictionary of the French tongue; which, after 50 years ſpent in ſettling the words and phraſes to be uſed in writing, was at laſt publiſhed in 1694.

The foundation of an *Academy* ſimilar to the above, has been propoſed at Peterſburgh, by the learned princeſs Daſhkof: it is to conſiſt of 60 members. The plan has been approved by the empreſs, who has already given a fund for its ſupport and eſtabliſhment.

The Royal Spaniſh Academy at Madrid held its firſt meeting in July 1713, in the palace of its founder, the duke d'Eſcalona. It conſiſted at firſt of eight academiſts, including the duke; to which number 14 others were afterwards added, the founder being choſen preſident or director. In 1714, the king granted them his confirmation and protection. Their device is a crucible in the middle of the fire, with this motto, *Limpia, Fya, y da Eſplendor*; "it purifies, fixes, and gives brightneſs." The number of members is limited to 24; the duke d'Eſcalona to be director for life, but his ſucceſſors choſen yearly, and the ſecretary to be perpetual. Their object, as marked out by the royal declaration, was to cultivate and improve the national language: they were to begin with chuſing carefully ſuch words and phraſes as have been uſed by the beſt Spaniſh writers; noting the low, barbarous, or obſolete ones; and compoſing a dictionary wherein theſe may be diſtinguiſhed from the former.

XII. *Academies of* Politics; as that at Paris, conſiſting of ſix perſons, who met at the Louvre, in the chamber where the papers relating to foreign affairs were lodged. But this academy proved of little ſervice, as the kings of France were unwilling to truſt any but their miniſters with the inſpection of foreign affairs.

For a further account of ſimilar eſtabliſhments, ſee the article Society.

Academy is alſo a term for ſchools and other ſeminaries of learning among the Jews, where their rabbins and doctors inſtructed their youth in the Hebrew language, and explained to them the Talmud and the ſecrets of the Cabbala: Thoſe of Tiberias and Babylon have been the moſt noted.

The Romans had a kind of military academies, eſtabliſhed in all the cities of Italy, under the name of *Campi Martis*. Here the youth were admitted to be trained for war at the public expence. The Greeks, beſide academies of this kind, had military profeſſors called *Tactici*, who taught all the higher offices of war, &c. &c.

Academy is often uſed to denote a kind of collegiate ſeminary, where youth are inſtructed in arts and ſciences. There is one in Portſmouth in England for teaching navigation, drawing, &c.; another at Woolwich, for fortification, gunnery, &c.—Beſides theſe, there are numerous academies, for teaching mathematics, languages, writing, accounts, drawing, and other branches of learning.

The nonconformiſt miniſters, &c. in England, are bred up in private academies; as not approving the common univerſity education. The principal of their academies are thoſe in London, Daventry, and Warrington.

Academy is likewiſe a name given to a riding-ſchool, where young gentlemen are taught to ride the great horſe, &c. and the ground allotted is uſually called the *Manege*.

Academy Figure, a drawing of a naked man or woman, taken from the life; which is uſually done on paper with red or black chalk, and ſometimes with paſtils or crayons. See Academy, Nº VI. par. 4. *ſupra*.

ACADIE, or Acady, in geography, a name formerly given to Nova Scotia, or new Scotland. See *Nova Scotia*.

ACÆNA, in antiquity, a Grecian meaſure of length, being a ten feet rod, uſed in meaſuring their lands.

ACÆNA, in botany, a genus of the monogynia order belonging to the tetrandria claſs of plants; the characters of which are theſe: The *calyx* is a perianthium conſiſting of four leaves, which are ovate, concave, equal, and perſiſtent; there is no *corolla:* The *ſtamina* conſiſts of four equal middle-ſized filaments oppoſite to the calyx; the antheræ are quadrangular, twin, erect: The *piſtillum* has an inverſely-ovate hiſped germ; the ſtylus is ſmall, and inflected on one ſide; and the ſtigma is a ſmall thickiſh coloured membrane, divided into many ſegments: The *pericarpium* is an inverſely-ovated dry one-celled berry covered with prickles bent backwards: The *ſeed* is ſingle. There is only one ſpecies, a native of Mexico.

ACAJOU, or CASHEW-NUT-TREE. See ANACARDIUM.

ACALANDRUS, a river falling into the bay of Tarentum, not far from the Metapontum, (Pliny, Strabo); now *Fiume de Roſeto*.

ACALEPTIC, in ancient proſody, a complete verſe.

ACALYPHA, the THREE-SEEDED MERCURY, a genus of plants belonging to the monœcia monadelphia claſs. The characters of this genus are the following.—*Male flowers* crowded above the female ones: The *calyx* is a three or four-leaved perianthium, the leaflets roundiſh, concave, and equal: The *corolla* is wanting: The *ſtamina* have from 6 to 18 filaments, which are ſhort, crowded, and connected at the baſe; the antheræ are roundiſh.—*Female flowers* fewer, placed beneath, and received into a large divided involucrum: The *calyx* is a perianthium, conſiſting of three leaflets, which are concave, converging, ſmall, and perſiſtent: No *corolla:* The *piſtillum* has a roundiſh germen; the ſtyli are three, branchy, oftener tripartite, and long; the ſtigmata are ſimple: The *pericarpium* has a roundiſh triſulcated trilocular capſule, the valvulets gaping two ways: The *ſeeds* are ſolitary, roundiſh, and large.—This genus ranks in the 38th natural order, *Tricoccæ*. There are five ſpecies, all natives of Virginia.

ACAMANTIS (the ancient name of the iſland of Cyprus), taken from one of its promontories ſituated on the weſt, and called *Acamas*. Teos in Ionia was alſo called thus from Acamus the founder.

ACAMAS, ACAMANTIS (anc. geog.), the weſt promontory of the iſland of Cyprus, from whence it took its ancient name; now Cape *Piſanio* or *Epiſanio*, where formerly was a town of the ſame name, now a village called *Cruſocco*.

ACAMAS, ſon of Theſeus, followed the reſt of the Grecian princes to the ſiege of Troy; and was deputed with Diomedes, to the Trojans, in order to get Helen reſtored. Laodice, Priam's daughter, fell in love with him, ſtole a night with him, and had a ſon by him called Munitus. He was one of the heroes who concealed themſelves in the wooden horſe. One of the tribes of Athens was called *Acamantides* from him, by the appointment of the oracle; and he founded a city in Phrygia Major, called *Acamantium*. Homer mentions two other heroes of this name; one a Thracian prince who came to ſuccour Priam, another a ſon of Antenor.

ACANACEOUS PLANTS, ſuch as are armed with prickles.

ACANGIS, that is, *Ravagers* or *Adventurers;* a name which the Turks give their huſſars or light-troops, who are generally ſent out in detachments to procure intelligence, haraſs the enemy, or ravage the country.

ACANTHA, in botany, the prickle of any plant; in zoology, a term for the ſpine or prickly fins of fiſhes.

ACANTHABOLUS, in ſurgery, an inſtrument for pulling thorns, or the like, out of the ſkin.

ACANTHINE, any thing reſembling or belonging to the herb acanthus. Acanthine garments, among the ancients, are ſaid to be made of the down of thiſtles; others think they were garments embroidered in imitation of the acanthus.

ACANTHOPTERYGIOUS FISHES, a term uſed by Linnæus and others for thoſe fiſhes whoſe back-fins are hard, oſſeous, and prickly.

ACANTHOS, a town of Egypt, near Memphis, (Pliny); now *Biſalta*. Alſo a maritime town of Macedonia, to the weſt of mount Athos, a colony of Andrians, (Thucydides, Ptolemy); now *Eriſſo;* near which was ſhewn Xerxes's ditch, of ſeven ſtadia, in order to ſeparate mount Athos from the continent, and convey his ſhips, without doubling Athos, into the Singitic Bay. *Acanthos*, is alſo a town of Epirus.

ACANTHUS, BEAR'S-BREECH, or *brank-urſine*, in botany: a genus of the angioſpermia order, belonging to the didyanamia claſs of plants; and ranking in the 4th natural order, *Perſonatæ*. The generic characters are: The *calyx* is a perianthium with leaflets of three alternate pairs unequal and perſiſtent: The *corolla* is one-petaled and unequal; the tubus very ſhort, cloſed with a beard; no upper lip, the under one very large, flat, ſtraight, very broad, three-lobed, and obtuſe: The *ſtamina* have four ſubulated filaments ſhorter than the corolla; the two ſuperior rather longer, recurvate, and incurved at the top; the antheræ are oblong, compreſſed, obtuſe, lateral, parallel, and villous before: The *piſtillum* has a conic germen; a filiform ſtylus, the length of the ſtamina; and two acute lateral ſtigmata: The *perianthium* is an acutely ovated bilocular capſule, with a lateral partition: The *ſeeds* one or two, fleſhy and gibbous.

Species. 1. The mollis, or common bear's-breech, a native of Italy, is the ſort that is uſed in medicine, and is ſuppoſed to be the *mollis acanthus* of Virgil; and the leaves are famous for having given riſe to the capital of the Corinthian pillars. 2. The ſpinoſus, or prickly bear's-breech; the leaves of which are deeply jagged in very regular order, and each ſegment is terminated with a ſharp ſpine, as are alſo the footſtalks of the leaves and the empalement of the flower, which renders it troubleſome to handle them. 3. Ilicifolius, or ſhrubby bear's-breech, grows naturally in both the Indies. It is an evergreen ſhrub, which riſes about four feet high; and is divided into many branches, garniſhed with leaves like thoſe of the common holly, and armed with ſpines in the ſame manner: the flowers are white, and ſhaped like thoſe of the common acanthus, but ſmaller. 4. The nigra, or Portugal bear's-breech, with ſmooth ſinuated leaves of a livid green colour, was diſcovered in Portugal by Dr Juſſieu of the royal garden at Paris. 5. The middle bear's-breech, with entire leaves, having ſpines on their border, is ſuppoſed to be the acanthus of Dioſcorides.

Culture, &c. They are all perennial plants. The firſt and ſecond ſpecies may be propagated either by ſeeds, or by offsets from the roots. The beſt way is to raiſe them from the ſeeds; which ſhould be ſown about the end of March, in a light ſoil. They are beſt dropped at diſtances into ſhallow drills, and covered three quarters of an inch with mould. When the plants are come up, the ſtrongeſt ſhould be marked, and the reſt ſhould be pulled up, that they may ſtand at a yard diſtance one from another. They require no other culture but to keep them clear from weeds. The third, fourth, and fifth ſorts, are propagated only by ſeeds; which, as they do not ripen in Europe, muſt be obtained from the places in which they grow naturally: the plants are ſo tender, that they cannot be preſerved out of the ſtove in northern countries.—The firſt ſpecies is the ſort uſed in medicine. All the parts of it have a ſoft ſweetiſh taſte, and abound with a mucilaginous juice: its virtues do not ſeem to differ from thoſe of althea and other mucilaginous plants.

Acanthus, in architecture, an ornament repreſenting the leaves of the acanthus, uſed in the capitals of the Corinthian and Compoſite orders.

ACAPULCO, a conſiderable town and port in Mexico, on the South Sea. It has a fine harbour, from whence a ſhip annually ſails to Manila in the Philippine iſlands, near the coaſt of China in Aſia; and another returns annually from thence with all the treaſures of the Eaſt Indies, ſuch as diamonds, rubies, ſapphires, and other precious ſtones; the rich carpets of Perſia; the camphire of Borneo; the benjamin and ivory of Pegu and Cambodia; the ſilks, muſlins, and calicoes, of the Mogul's country; the gold-duſt, tea, china-ware, ſilk, and cabinets, of China and Japan; beſides cinnamon, cloves, mace, nutmegs, and pepper; inſomuch that this ſingle ſhip contains more riches than many whole fleets. The goods brought to Acapulco are carried to the city of Mexico by mules and pack-horſes; and from thence to Vera Cruz on the North Sea, in order to be ſhipped for Europe. Acapulco itſelf is a ſmall place, conſiſting of about 2 or 300 thatched houſes. Ships arrive at the port by two inlets, ſeparated from each other by a ſmall iſland; the entrance into them in the day time is by means of a ſea-breeze, as the ſailing out in the night-time is effected by a land-breeze. A wretched fort, 42 pieces of cannon, and a garriſon of 60 men, defend it. It is equally extenſive, ſafe, and commodious. The baſon which conſtitutes this harbour is ſurrounded with lofty mountains, which are ſo dry, that they are even deſtitute of water. The air here is hot, heavy, and unwholeſome; to which none can habituate themſelves, except certain negroes that are born under a ſimilar climate, or ſome mulattoes. This feeble and miſerable colony is crowded with a vaſt acceſſion to its numbers upon the arrival of the galleons; traders flocking here from all the provinces of Mexico, who come to exchange European toys, their own cochineal, and about ten millions[*] of ſilver for ſpices, muſlins, printed linens, ſilks, perfumes, and the gold works of Aſia. W. Long. 102. 29. N. Lat. 17. 30.

ACARAI, a town of Paraguay in South-America, built by the Jeſuits in 1624. Long. 116. 40. S. Lat. 26′.

ACARAUNA, a ſmall American fiſh, called by ſailors *the old-wife*. See Labrus.

ACARNANIA, the firſt country of Free Greece, or Greece Proper, bounded on the weſt by the Sinus Ambracius, and ſeparated from Ætolia by the river Achelous on the eaſt, and by the Sinus Ambracius from Epirus. The people were called *Acarnanes*, denoting perſons unſhorn; other Etolians, to the eaſt of the Achelous, being called *Curetes* (Homer) from being ſhorn. According to Lucian, they were noted for effeminacy and incontinence; hence the proverb, *Porcellus Acarnanius*. This country was famous for an excellent breed of horſes; ſo that Ακαρνικας ἱππος, is a proverbial ſaying for a thing excellent in its kind. It is now called *la Carnia* and *il Deſpotato*.

ACARON, or Accaron, a town of Paleſtine, called *Ekron* in ſcripture. It was the boundary of the Philiſtines to the north; ſtood at ſome diſtance from the ſea, near Bethſhemeſh; and was famous for the idol of Baalzebub.

ACARUS, the Tick or Mite: a genus of inſects belonging to the order of aptera, or ſuch as have no wings. The acarus has eight legs; two eyes, one on each ſide of the head; and two jointed tentacula. The female is oviparous. Linnæus enumerates 35 ſpecies; of which ſome are inhabitants of the earth, ſome of waters; ſome live on trees, others among ſtones, and others on the bodies of other animals, and even under their ſkin. The deſcription of a few of the moſt remarkable will here ſuffice.

1. The ſiro, or cheeſe-mite, is a very minute ſpecies. To the naked eye, theſe mites appear like moving particles of duſt; but the microſcope diſcovers them to be perfect animals, having as regular a figure, and performing all the functions of life as perfectly, as creatures that exceed them many times in bulk. The principal parts of them are the head, the neck, and the body. The head is ſmall in proportion to the body; and has a ſharp ſnout, and a mouth that opens and ſhuts like a mole's. They have two ſmall eyes, and are extremely quickſighted; and when they have been once touched with a pin, you may eaſily perceive how cunningly they avoid a ſecond touch. Their legs are each furniſhed at the extremity with two little claws, with which the animal very nicely takes hold of any thing. The hinder part of the body is plump and bulky; and ends in an oval form, from which there iſſue out a few exceeding long hairs. Other parts of the body are alſo beſet with thin long hairs. The males and females are eaſily diſtinguiſhed in theſe little animals. The females are oviparous, as the louſe and ſpider; and from their eggs the young ones are hatched in their proper form, without having any change to undergo afterwards. They are, however, when firſt hatched, extremely minute; and, in their growing to their full ſize, they caſt their ſkins ſeveral times. Theſe little creatures may be kept alive many months between two concave glaſſes, and applied to the microſcope at pleaſure. They are thus often ſeen *in coitu*, conjoined tail to tail; and this is performed by an incredibly ſwift motion. Their eggs, in warm weather, hatch in 12 or 14 days; but in winter they are much longer. Theſe eggs are ſo ſmall, that a regular computation ſhows, that 90 millions of them are not ſo large as a common pigeon's egg[*]. They are very voracious animals, and have often been ſeen to eat one another. Their manner of eating is by thruſting alternately one

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[*] 437,500l. Sterling.

[*] *Baker's Microſcope*, p. 187.

jaw forward and the other backward, and in this manner grinding their food; and after they have done feeding, they ſeem to chew the cud.—There are ſeveral varieties of this ſpecies found in different ſubſtances beſides cheeſe; as in malt-duſt, flour, oatmeal, &c. Thoſe in malt-duſt and oatmeal are much nimbler than the cheeſe-mites, and have more and longer hairs. There are alſo a ſort of wandering mites, which range wherever there is any thing they can feed on: They are often ſeen in the form of a white duſt, and are not ſuſpected to be living creatures.—The mite is called by authors, ſimply, *Acarus*. It is an animal very tenacious of life, and will live months without food. Mr Lewenhoek[†] had one which lived 11 weeks on the point of a pin, on which he had fixed it for examining by his microſcope.

2. The ſanguiſugus. The hinder part of the abdomen is crenated, the ſcuttellum is oval and yellowiſh, and the beak is trifid. It is a native of America, and ſticks ſo faſt on the legs of travellers, ſucking their blood, that they can hardly be extracted.

3. The telarius is of a greeniſh yellow colour. It has a ſmall ſting or weapon, with which it wounds the leaves of plants, and occaſions them to fold backward. They are very frequently to be met with in the autumn, incloſed in the folded leaves of the lime-tree.

4. The exulcerans, or itch-acarus, is a very ſmall ſpecies: its body is of a figure approaching to oval, and lobated; the head is ſmall and pointed; its colour is whitiſh, but it has two duſky ſemicircular lines on the back. It has long ſetaceous legs, but the two firſt are ſhort. It is found in the puſtules of the itch: authors in general have ſuppoſed that it cauſes that diſeaſe; but others obſerve, that if this were ſo, it would be found more univerſally in thoſe puſtules. It is more probable that theſe only make a proper nidus for it. See, however, the article Itch.

5. The batatas is of a blood-colour, and a little rough; the fore pair of legs are as long as the body. It inhabits the potatoes of Surinam.

6. The ovinus, or ſheep-tick, has a flat body, of a roundiſh figure, but ſomewhat approaching to oval, and of a yellowiſh white colour, and has a ſingle large round ſpot on the back: the anus is viſible in the lower part of the body; the thorax is ſcarce conſpicuous; the head is very ſmall and black; the mouth is bifid: the antennæ are of a clavated figure, and of the length of the ſnout; the legs are ſhort and black. It is common on ſheep, and its excrements ſtain the wool green; it will live in the wool many months after it is ſhorn from the animal.

7. The coleoptratorum, or acarus of inſects, is extremely minute: its body is round, reddiſh, and covered with a firm and hard ſkin; the head is very ſmall, the neck ſcarce viſible; the legs are moderately long, the anterior pair longer than the others; it has a whiteneſs about the anus. It is frequent on the bodies of many inſects, which it infeſts, as the louſe does others; it runs very ſwiftly: the humble-bee, and many other of the larger inſects, are continually infeſted with it: but none ſo much as the common black beetle, which has thence been called the louſy beetle.

8. The baccarum, or ſcarlet tree-mite, is a ſmall ſpecies: its body is roundiſh, and the back not at all flatted, as it is in many others; the ſkin is ſmooth, ſhining, and gloſſy; and the whole animal ſeems diſtended, and ready to burſt; the colour is a bright red, but a little duſkier on the ſides than elſewhere: the head is very ſmall, and the legs ſhort; there is on each ſide a ſmall duſky ſpot near the thorax, and a few hairs grow from different parts of the body. It is very common on trees, particularly on the currant, on the fruit of which we frequently ſee it running.

9. The longicornis, or red ſtone-acarus, is very ſmall and of a bright red colour; the body is round, and diſtended; the head is very ſmall and pointed; the legs are moderately long, and of a paler red than the body: the antennæ are much longer than in any other ſpecies. It is frequent about old ſtone-walls and on rocks, and runs very nimbly. See Plate I.

10. The aquaticus is a ſmall ſpecies: the body is of a figure approaching to an oval, and the back appears depreſſed; it is of a bright and ſtrong ſcarlet colour. The head is ſmall; the legs are moderately long and firm, and are of a paler red than the body. It is common in ſhallow waters, where it runs very ſwiftly along the bottom. Its diminutiveneſs hinders the beauty of its colours from being perceived, as they are not diſcernible without the microſcope.

11. The holoſericeus is a ſmall ſpecies: its body is roundiſh, but a little approaching to oval; the back ſomewhat depreſſed: it is of a fine ſcarlet colour, and covered with a velvety down. The head is very ſmall; the eyes are two, and very ſmall; the legs are ſhort and of a paler red, and there is a ſmall black ſpot near the inſertion of the anterior ones. It is very common under the ſurface of the earth, and ſometimes on herbs and among hay. It is ſuppoſed to be poiſonous if ſwallowed; but we do not ſeem to have any certain account of ſuch an effect.

12. The longpipes is the largeſt of the acarus kind: its body is roundiſh, of a duſky brown on the back, with a duſkier ſpot of a rhomboidal figure near the middle of it; the belly is whitiſh; the legs are extremely long and ſlender. On the back part of the head there ſtands a little eminence, which has on it a kind of double creſt, formed as it were of a number of minute ſpines: the eyes are ſmall and black, and are two in number. It is very common in our paſtures towards the end of ſummer. Ray and Liſter call it *araneus cruſtatus longpipes*; Mouffet, *araneus longpipes*; and, notwithſtanding its having but two eyes, it has been almoſt univerſally ranked among the ſpiders.

ACASTUS, in claſſic hiſtory, the ſon of Pelias king of Theſſaly, and one of the moſt famous hunters of his time, married Hippolyta, who falling deſperately in love with Peleus her ſon-in-law, and he refuſing to gratify her wiſhes, ſhe accuſed him to her huſband of a rape; on which he ſlew them both.

ACATALECTIC, a term, in the ancient poetry, for ſuch verſes as have all their feet or ſyllables, in contradiſtinction to thoſe that have a ſyllable too few.

ACATALEPSY, ſignifies the impoſſibility of comprehending ſomething.—The diſtinguiſhing tenet of the Pyrrhoniſts was their aſſerting an abſolute acatalepſy in regard to every thing.

ACATERY, or Accatry, anciently an officer of the king's houſehold, deſigned for a check betwixt the clerks of the kitchen and the purveyors.

[†] *Arcan. Nat.* tom. iv. p. 368.

ACATHARSIA, in medicine, an impurity of the blood or humours.

ACATHISTUS, the name of a ſolemn hymn anciently ſung in the Greek church on the Saturday of the fifth week of Lent, in honour of the Virgin, for having thrice delivered Conſtantinople from the invaſions of the barbarous nations.

ACATIUM, in the ancient navigation, a kind of boat or pinnace uſed for military purpoſes. The *acatium* was a ſpecies of thoſe veſſels called *naves actuariæ, i. e.* ſuch as were wrought with oars. It was ſometimes made uſe of in battle. Strabo deſcribes it as a privateer or private ſloop.

ACAULIS, in botany, a term applied to certain plants, the flowers of which have no pedicule or ſtalk to ſupport them, but reſt immediately on the ground, ſuch as the carline thiſtle, &c.

ACCA (St.) biſhop of Haguſtaldt, or Hexham, in Northumberland, ſucceeded Wilfrid in that ſee in 709. He ornamented his cathedral in a moſt magnificent manner: he furniſhed it alſo with plate and holy veſtments; and erected a noble library, conſiſting chiefly of eccleſiaſtical learning, and a large collection of the lives of the ſaints, which he was at great pains to procure.—He was accounted a very able divine, and was famous for his ſkill in church-muſic. He wrote ſeveral pieces: particularly, *Paſſiones Sanctorum,* the Sufferings of the ſaints: *Pro illuſtrandis ſcripturis, ad Bedam;* For explaining the ſcriptures, addreſſed to Bede. He died in 740, having enjoyed the ſee of Hexham 31 years, under Egbert king of the Northumbrians.

ACCALIA, in Roman antiquity, ſolemn feſtivals held in honour of Acca Laurentia, Romulus's nurſe: they were otherwiſe called LAURENTALIA.

ACCAPITARE, in law, the act of becoming vaſſal of a lord, or of yielding him homage and obedience. Hence,

ACCAPITUM, ſignifies the money paid by a vaſſal upon his admiſſion to a feu.

ACCAPITUM, in our ancient law, was uſed alſo to expreſs the relief due to the chief lord. See RELIEF.

ACCEDAS AD CURIAM, in the Engliſh law, a writ lying, where a man has received, or fears, falſe judgment in an inferior court. It lies alſo for juſtice delayed, and is a ſpecies of the writ RECORDARE.

ACCELERATION, in mechanics, the increaſe of velocity in a moving body. Accelerated motion is that which continually receives freſh acceſſions of velocity. Acceleration ſtands directly oppoſed to *retardation,* which denotes a diminution of velocity.

ACCELERATION is chiefly uſed in phyſics, in reſpect of falling bodies, *i. e.* of heavy bodies tending towards the centre of the earth by the force of gravity. That natural bodies are accelerated in their deſcent, is evident from various conſiderations, both *à priori* and *poſteriori.*—Thus, we actually find, that the greater height a body falls from, the greater impreſſion it makes, and the more vehemently does it ſtrike the ſubject plane, or other obſtacle.

Various were the ſyſtems and opinions which philoſophers produced to account for this acceleration. But the immediate cauſe of acceleration is now ſufficiently obvious; the principle of gravitation, which determines the body to deſcend, determining it to be accelerated by a neceſſary conſequence.

Suppoſe a body let fall from on high: the primary cauſe of its beginning to deſcend is doubtleſs the power of gravity; but when once the deſcent is commenced, that ſtate becomes in ſome meaſure natural to the body; ſo that if left to itſelf, it would perſevere in it for ever, even though the firſt cauſe ſhould ceaſe: as we ſee in a ſtone caſt with the hand, which continues to move after it is left by the cauſe that gave it motion. But, beſide the propenſity to deſcend impreſſed by the firſt cauſe, and which of itſelf were ſufficient to continue the ſame degree of motion, once begun, *in infinitum;* there is a conſtant acceſſion of ſubſequent efforts of the ſame principle, gravity, which continues to act on the body already in motion, in the ſame manner as if it were at reſt. Here, then, being a double cauſe of motion; and both acting in the ſame direction, viz. directly towards the centre of the earth; the motion they jointly produce muſt neceſſarily be greater than that of any one of them.—And the velocity thus increaſed having the ſame cauſe of increaſe ſtill perſiſting, the deſcent muſt neceſſarily be continually accelerated.

The motion of a body aſcending, or impelled upwards, is diminiſhed or retarded from the ſame principle of gravity, acting in a contrary direction, in the ſame manner as a falling body is accelerated: See RETARDATION. A body thus projected upwards, riſes till it has loſt all its motion: which it does in the ſame time that a body falling would have acquired a velocity equal to that wherewith the body was thrown up. Hence the ſame body thrown up, will riſe to the ſame height from which falling it would have acquired the velocity wherewith it was thrown up: And hence the heights which bodies thrown up with different velocities do aſcend to, are to one another as the ſquares of thoſe velocities.

ACCELERATION of Bodies on inclined Planes. The ſame general law obtains here as in bodies falling perpendicularly: the effect of the plane is to make the motion ſlower; bnt the inclination being every where equal, the retardation ariſing therefrom will proceed equally in all parts, at the beginning and the ending of the motion. See MECHANICS.

ACCELERATION of the Motion of Pendulums—The motion of pendulous bodies is accelerated in their deſcent; but in a leſs ratio than that of bodies falling perpendicularly. See MECHANICS and PENDULUM.

ACCELERATION of the Motion of Projectiles. See PROJECTILE.

ACCELERATION is alſo applied in the ancient aſtronomy, in reſpect of the fixed ſtars.—This acceleration was the difference between the revolution of the *primum mobile* and the ſolar revolution; which was computed at three minutes and 56 ſeconds.

ACCELERATION of the Moon, a term uſed to expreſs the increaſe of the moon's mean motion from the ſun, compared with the diurnal motion of the earth; ſo that it is now a little ſwifter than it was formerly. Dr Halley was the firſt who made this diſcovery; and he was led to it by comparing the ancient eclipſes obſerved at Babylon with thoſe obſerved by Albatennius in the ninth century, and ſome of his own time. He was not able to aſcertain the quantity of this acceleration, becauſe the longitudes of Bagdad, Alexandria, and Aleppo, where the obſervations were made, had not been accurately determined. But ſince his time, the longitude of Alexandria has been aſcertained by Chazelles; and Babylon, according to Ptolemy's account, lies 50′ eaſt from Alexandria. From theſe *data*, Mr Dunthorne compared ſeveral ancient and modern eclipſes, with the calculations of them, by his own tables, and hereby verified Dr Halley's opinion; for he found that the ſame tables repreſent the moon's place more backward than her true place in ancient eclipſes, and more forward than her true place in later eclipſes; and thence juſtly inferred, that her motion in ancient times was ſlower, in later times quicker, than the tables give it. But he did not content himſelf with merely aſcertaining the fact; he proceeded to determine the quantity of the acceleration; and by means of the moſt ancient eclipſe of which any authentic account remains, obſerved at Babylon in the year before Chriſt 721, he concluded, that the obſerved beginning of this eclipſe was not above an hour and three-quarters before the beginning by the tables; and therefore the moon's true place could precede her place by computation but little more than 50′ of a degree at that time. Admitting the acceleration to be uniform, and the aggregate of it as the ſquare of the time, it will be at the rate of about 10′ in 100 years.

Dr Long attributes the acceleration above deſcribed to one or more of theſe cauſes: either, 1. The annual and diurnal motion of the earth continuing the ſame, the moon is really carried round the earth with a greater velocity than heretofore: or, 2. The diurnal motion of the earth, and the periodical revolutions of the moon continuing the ſame, the annual motion of the earth round the ſun is a little retarded; which makes the ſun's apparent motion in the ecliptic a little ſlower than formerly; and, conſequently, the moon in paſſing from any conjunction with the ſun, ſpends leſs time before ſhe again overtakes the ſun, and forms a ſubſequent conjunction: in both theſe caſes, the motion of the moon from the ſun is really accelerated, and the ſynodical month actually ſhortened. Or, 3. The annual motion of the earth, and the periodical revolution of the moon continuing the ſame, the rotation of the earth round its axis is a little retarded: in this caſe, days, hours, minutes, ſeconds, &c. by which all periods of time muſt be meaſured, are of a longer duration; and conſequently the ſynodical month will appear to be ſhortened, though it really contains the ſame quantity of abſolute time as it always did. If the quantity of matter in the body of the ſun be leſſened by the particles of light continually ſtreaming from it, the motion of the earth round the ſun may become ſlower: if the earth increaſes in bulk, the motion of the moon round the earth may be quickened thereby. See Astronomy.

ACCELERATOR, in anatomy, the name of two muſcles of the penis, which ſerve for ejecting the urine or ſemen. See Anatomy, *Table of the Muſcles*.

ACCENDENTES, a lower order of miniſters in the Romiſh church, whoſe office is to light and trim the candles.

ACCENDONES, in Roman antiquity, a kind of gladiators, whoſe office was to excite and animate the combatants during the engagement. The orthography of the word is conteſted: the firſt edition of Tertullian, by Rhenanus, has it *accedones*; an ancient manuſcript, *accendones*. Aquinas adheres to the former, Pitiſcus to the latter. The origin of the word, ſuppoſing it *accendones*, is from *accendo*, I kindle; ſuppoſing it *accedones*, from *accedo*, I accede, am added to. The former places their diſtinguiſhing character in enlivening the combat by their exhortations and ſuggeſtions; the latter ſuppoſes them to be much the ſame with what among us are called *ſeconds*, among the Italians *patroni*: excepting that theſe latter only ſtand by to ſee the laws of the ſword duly obſerved, without intermeddling to give advice or inſtruction.

ACCENSI, in the Roman armies, certain ſupernumerary ſoldiers, deſigned to ſupply the place of thoſe who ſhould be killed or anywiſe diſabled. They were thus denominated, *quia accenſebantur*, or *ad cenſum adjiciebantur*. Vegetius calls them *ſupernumerarii legionum*. Cato calls them *ferentarii*, in regard they furniſhed thoſe engaged in battle with weapons, drink, &c. Though Nonnius ſuggeſts another reaſon of that appellation, viz. becauſe they fought with ſtones, ſlings, and weapons *quæ ferruntur*, ſuch as are thrown, not carried in the hand. They were ſometimes alſo called *velitis*, and *velati*, becauſe they fought clothed, but not in armour; ſometimes *adſcripticii*, and *adſcriptivi*; ſometimes *rorarii*. The *accenſi*, Livy obſerves, were placed at the rear of the army, becauſe no great matter was expected from them: they were taken out of the fifth claſs of citizens.

Accensi, in antiquity, denotes an inferior order of officers, appointed to attend the Roman magiſtrates, ſomewhat in the manner of uſhers, ſerjeants, or tipſtaves among us. They were thus called from *accire*, to ſend for: one part of their office being to call aſſemblies of the people, ſummon parties to appear and anſwer before the judges, &c.

Accensi, was alſo an appellation given to a kind of adjutants, appointed by the tribune to aſſiſt each centurion and decurion. In which ſenſe, *accenſus* is ſynonymous with *optio*. In an ancient inſcription given by á Torre, we meet Accensus Equitum Romanorum: an office no where elſe heard of. That author ſuſpects it for a corruption; and inſtead thereof reads, a censibus.

ACCENSION, the action of ſetting a body on fire: thus the accenſion of timber is effected by ſtriking fire with flint and ſteel.

ACCENT, in reading or ſpeaking, an inflection of the voice, which gives to each ſyllable of a word its due pitch in reſpect of height or lowneſs. See Reading. The word is originally Latin, *accentus*: a compound of *ad*, to; and *cano*, to ſing. *Accentus*, *quaſi adcantus*, or *juxta cantum*. In this ſenſe, accent is ſynonymous with the Greek τονος; the Latin *tenor*, or *tonor*; and the Hebrew טעם, *guſtus*, taſte.—For the doctrine of *Accents* in *Compoſition*, ſee Poetry, Part III. N° 103. 114.

Accent, among grammarians, is a certain mark or character placed over a ſyllable, to direct the ſtreſs of its pronunciation. We generally reckon three grammatical accents in ordinary uſe, all borrowed from the Greek, viz. the *acute accent*, (′), which ſhows when the tone of the voice is to be raiſed. The *grave accent* (‵), when the note or tone of the voice is to be depreſſed. The *circumflex accent* (˜ or ˆ), is compoſed of both the acute and the grave, and points out a kind

Accent.

of undulation of the voice. The Latins have made the ſame uſe of theſe three accents.

The Hebrews have a grammatical, a rhetorical, and muſical accent: though the firſt and laſt ſeem, in effect, to be the ſame; both being compriſed under the general name of *tonic accents*, becauſe they give the proper tone to ſyllables; as the rhetorical accents are ſaid to be euphonic, becauſe they tend to make the pronunciation more ſweet and agreeable. There are four euphonic accents, and 25 tonic; of which ſome are placed above, and others below the ſyllables; the Hebrew accents ſerving not only to regulate the riſings and fallings of the voice, but alſo to diſtinguiſh the ſections, periods, and numbers of periods, in a diſcourſe; and to anſwer the ſame purpoſes with the points in other languages. Their accents are divided into *emperors*, *kings*, *dukes*, *&c.* each bearing a title anſwerable to the importance of the diſtinction it makes. Their emperor rules over a whole phraſe, and terminates the ſenſe completely; anſwering to our point. Their king anſwers to our colon; and their duke to our comma. The king, however, occaſionally becomes a duke, and the duke a king, as the phraſes are more or leſs ſhort. It muſt be noted, by the way, that the management and combination of theſe accents differ in Hebrew poetry from what they are in proſe. The uſe of the tonic or grammatical accents has been much controverted: ſome holding that they diſtinguiſh the ſenſe; while others maintain that they are only intended to regulate the muſic, or ſinging; alleging that the Jews ſing, rather than read, the ſcriptures in their ſynagogues*. Be this, however, as it will, it is certain the ancient Hebrews were not acquainted with theſe accents. The opinion which prevails amongſt the learned, is, that they were invented about the ſixth century, by the Jewiſh doctors of the ſchool of Tiberias, called the *Maſſoretes*.

As to the Greek accents, now ſeen both in manuſcripts and printed books, there has been no leſs diſpute about their antiquity and uſe than about thoſe of the Hebrews. Iſaac Voſſius endeavours to prove them of modern invention; aſſerting, that anciently they had nothing of this kind, but only a few notes in their poetry, which were invented by Ariſtophanes the grammarian, about the time of Ptolemy Philopater; and that theſe were of muſical, rather than grammatical uſe, ſerving as aids in the ſinging of their poems, and very different from thoſe introduced afterwards. He alſo ſhows from ſeveral ancient grammarians, that the manner of writing the Greek accents in theſe days was quite different from that which appears in our books. The author of *La Methode Greque*, p. 546, obſerves, that the right pronunciation of the Greek language being natural to the Greeks, it was needleſs for them to mark it by accents in their writings: ſo that, according to all appearance, they only began to make uſe of them ſo low as the time in which the Romans, being curious to learn the Greek tongue, ſent their children to ſtudy at Athens, thinking thereby to fix the pronunciation, and to facilitate it to ſtrangers; which happened, as the ſame author obſerves, a little before Cicero's time. Wetſtein, Greek profeſſor at Baſil, in a learned diſſertation endeavours to prove the Greek accents of an older ſtanding. He owns that they were not always formed in the ſame manner by the ancients; but thinks that difference owing to the different pronunciation which obtained in the different parts of Greece. He brings ſeveral reaſons, *à priori*, for the uſe of accents, even in the earlieſt days: as that they then wrote all in capital letters equidiſtant from each other, without any diſtinction either of words or phraſes, which without accents could ſcarce be intelligible; and that accents were neceſſary to diſtinguiſh ambiguous words, and to point out their proper meaning; which he confirms from a diſpute on a paſſage in Homer, mentioned by Ariſtotle in his *Poëtics*, chap. v. Accordingly, he obſerves, that the Syrians, who have tonic, but no diſtinctive accents, have yet invented certain points, placed either below or above the words, to ſhew their mood, tenſe, perſon, or ſenſe.

Accent, Acceptation.

The uſe of accents, to prevent ambiguities, is moſt remarkably perceived in ſome eaſtern languages, particularly the Siameſe and Chineſe. Among the people of China, every word, or (which is the ſame thing) ſyllable, admits of five accents, as ſpoken more acutely or remiſsly; and thus ſtands for many different things. The ſame ſound *ya*, according to the accent fixed to it, ſignifies *God*, a *wall*, *excellent*, *ſtupidity*, and a *gooſe*. The Chineſe have but 330 ſpoken words in their language; but theſe being multiplied by the different accents or tones, which affect the vowels, furniſh a language tolerably copious. By means hereof, their 330 ſimple ſounds come to denote 1650 things; but this being hardly ſufficient, they are increaſed further by aſpirates added to each word to double the number. The Chineſe only reckon four *accents*: for which the miſſionaries uſe the following marks, *aá*, *â*, *à*, *a˘*; to which they have added a fifth, thus, *ã*. They make a kind of modulation: wherein, prolonging the duration of the ſound of the vowel, they vary the tone, raiſing and ſinking it by a certain pitch of voice: ſo that their talking is a ſort of muſic or ſinging. Attempts have been made to determine the quantity of the riſe or fall in each accent by means of muſical notes; but this is hard to effect, as being different in different perſons. Hence the great difficulty of the language to foreigners; they are forced to ſing moſt ſcrupulouſly: if they deviate ever ſo little from the accent, they ſay quite a different thing from what was intended. Thus, meaning to compliment the perſon you are talking to with the title *Sir*, you call him a beaſt with the ſame word, only a little varied in the tone. Magalhon makes the language the eaſier to learn on this account.—The Siameſe are alſo obſerved to ſing rather than talk. Their alphabet begins with ſix characters, all only equivalent to a K, but differently accented. For tho' in the pronunciation the accents are naturally on the vowels, yet they have ſome to diverſify ſuch of their conſonants as are in other reſpects the ſame.

Accent, in muſic, is a certain enforcement of particular ſounds, whether by the voice or inſtruments, generally uſed at the beginning of bars.

ACCEPTANCE, in law, a perſon's agreeing to offers made in bargaining, by which the bargain is concluded.

Acceptance, in the church of Rome, is put for receiving the pope's conſtitutions.

Acceptance, in commerce, is the ſubſcribing, ſigning, and making one's ſelf debtor for the ſum contained in a bill of exchange or other obligation.

ACCEPTATION, in grammar, the ſenſe or meaning wherein any word is taken.

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* Cooper, Dom. Moſaic Clav. p. 31.

ACCEPTER, or Acceptor, the perſon who accepts a bill of exchange, &c.

ACCEPTILATION, among civilians, an acquittance or diſcharge given by the creditor to the debtor without the payment of any value.

ACCESSIBLE, ſome thing that may be approached, or that acceſs may be had to. Thus we ſay, Such a place is acceſſible on one ſide, &c.

ACCESSION, in law, is a method of acquiring property, by which, in things that have a cloſe connection or dependence upon one another, the property of the principal thing draws after it the property of the acceſſory: Thus, the owner of a cow becomes likewiſe the owner of the calf. It ſometimes likewiſe ſignifies conſent or acquieſcence.

Accession, among phyſicians, is uſed for a paroxyſm of a diſeaſe; among politicians, it ſignifies a prince's ſucceeding to the government upon the death of his predeceſſor.

ACCESSORY, or Accessary, ſomething that accedes, or is added to another more conſiderable thing; in which ſenſe the word ſtands oppoſed to principal.

Accessory, or *Acceſſary*, in common law is chiefly uſed for a perſon guilty of a felonius offence, not principally, but by participation: as, by advice, command, or concealment.

There are two kinds of *acceſſories*: *before* the fact, and *after* it.—The *firſt* is he who commands, or procures another to commit a felony, and is not preſent himſelf; for if he be preſent he is a principal. The *ſecond* is he who receives, aſſiſts, or comforts any man that has done murder, or felony, whereof he has knowledge. A man may alſo be acceſſory to an acceſſory, by aiding, receiving, &c. an acceſſory in felony.

An acceſſory in felony ſhall have judgment of life and member, as well as the principal who did the felony; but not till the principal be firſt attainted, and convict, or outlawed thereon. Where the principal is pardoned without attainder, the acceſſory cannot be arraigned; it being a maxim in law, *Ubi non eſt principalis, non poteſt eſſe acceſſorius:* but if the principal be pardoned, or have his clergy after attainder, the acceſſory ſhall be arraigned; 4 and 5 W. et M. cap. 4. And by ſtat. 1 Anne, cap. 9. it is enacted, that where the principal is convicted of felony, or ſtands mute, or challenges above 20 of the jury, it ſhall be lawful to proceed againſt the acceſſory in the ſame manner as if the principal had been attainted; and notwithſtanding ſuch principal ſhall be admitted to his clergy, pardoned, or delivered before attainder. In ſome caſes only, if the principal cannot be taken, then the acceſſory may be proſecuted for a miſdemeanour, and puniſhed by fine, impriſonment, &c. In the loweſt and higheſt offences there are no acceſſories, but all are principals: as in riots, routs, forcible entries, and other treſpaſſes, which are the loweſt offences. So alſo in the the higheſt offence, which is, according to the Engliſh law, high treaſon, there are no acceſſories.

Acceſſories, in petty treaſon, murder, and in felonies of ſeveral kinds, are not to have their clergy. There can be no acceſſory before the fact in manſlaughter; becauſe that is ſudden and unprepenſed.

Accessory Nerves, in anatomy, a pair of nerves, which, ariſing from the medula in the vertebræ of the neck, aſcend and enter the ſkull, and paſs out of it again with the par vagum, wrapped up in the ſame common integument, and after quitting them are diſtributed into the muſcles of the neck and ſhoulders. See Anatomy.

Accessory, among painters, an epithet given to ſuch parts of an hiſtory-piece as ſerve chiefly for ornament, and might have been wholly left out: ſuch as vaſes, armour, &c.

ACCI, (*anc. geog.*) a town of Tarraconenſis, formerly called *Acti;* ſuppoſed to be *Guadix*, to the eaſt of the city of Granada, at the foot of a mountain, near the ſource of the rivulet Guadalantin; now greatly decayed. It is the Colonia Accitania Gemella, and was of ſome repute among the Roman colonies. The people were called Gemellenſes, becauſe the colony conſiſted of coloniſts from the third and ſixth legions.

ACCIAIOLI (Donata), a man famous for his learning and the honourable employments he poſſeſſed in Florence his native country, in the 15th century. He wrote, A Latin tranſlation of ſome of Plutarch's Lives; Commentaries on Ariſtotle's Ethics and Politics; and the Life of Charlemagne. He was ſent to France by the Florentines, to ſue for ſuccour from Lewis XI. againſt Pope Sextus IV. but on his journey died at Milan; his body was carried to Florence, and buried in the church of the Carthuſians. The ſmall fortune he left his children is a proof of his probity and diſintereſtedneſs. His daughters, like thoſe of Ariſtides, were married at the public expence, as an acknowledgement of his ſervices. His funeral eulogium was ſpoken by Chriſtopher Landini; and an elegant epitaph, by Politian, was inſcribed on his tomb.

ACCIDENT, in a general ſenſe, denotes any caſual event.

Accident, among logicians, is uſed in a threefold ſenſe. 1. Whatever does not eſſentially belong to a thing; as the clothes a man wears, or the money in his pocket. 2. Such properties in any ſubject as are not eſſential to it; thus whiteneſs in paper is an accidental quality. 3. In oppoſition to ſubſtance, all qualities whatever are called accidents; as ſweetneſs, ſoftneſs, *&c.*

Accident, in grammar, implies a property attached to a word, without entering into its eſſential definition; for every word, notwithſtanding its ſignification, will be either primitive, derivative, ſimple, or compound, which are the accidents of words. A word is ſaid to be primitive, when it is taken from no other word in the language in which it is uſed: thus *heaven, king, good*, are primitive words. It is ſaid to be derivative, when it is taken from ſome other word: thus *heavenly, kingdom, goodneſs*, &c. are derivatives. A ſimple word is eaſily diſtinguiſhed from a compound: thus *juſt, juſtice*, are ſimple words; *unjuſt, injuſtice*, are compound: *res* is a ſimple word, as well as *publica;* but *reſpublica* is a compound. Beſides theſe accidents, which are common to all ſorts of words, each particular ſpecies has its accidents: thus the accidents of the noun ſubſtantive are the gender, declenſion, and number: and the adjective has another accident, namely, the compariſon. See the articles Grammar and Language.

Accident, in heraldry, an additional point or mark in a coat of arms, which may be either omitted or retained without altering the eſſence of the armour; ſuch as, abatement, difference, and tincture.

ACCIDENTAL, in a general ſenſe, implies ſomething that happens by accident, or that is not eſſential to its ſubject.

ACCIDENTAL, in philoſophy, is applied to that effect which flows from ſome cauſe intervening by accident, without being ſubject, or at leaſt without any appearance of its being ſubject, to general laws or regular returns. In this ſenſe, *accident* is oppoſed to *conſtant* and *principal*. Thus the ſun's place is with reſpect to the earth, the conſtant and principal cauſe of the heat in ſummer, and the cold in winter; whereas winds, ſnows, and rains, are the accidental cauſes which often alter and modify the action of the principal cauſe.

ACCIDENTAL Point, in perſpective, is that point in the horizontal line where the projections of two lines parallel to each other meet the perſpective plane.

ACCIDENTAL Colours, are thoſe which depend upon the affections of the eye, in contradiſtinction to thoſe which belong to the light itſelf. The impreſſions made upon the eye by looking ſtedfaſtly at a particular colour are various, according to the ſingle colour or combination of colours in the object; and they continue for ſome time after the eye is withdrawn, and give a falſe colouring to other objects. Mr Buffon has endeavoured to trace the connexions which theſe accidental colours have with ſuch as are natural, in a variety of inſtances. The ſubject has alſo been conſidered by De la Hire, and M. Epences; and M. d'Arcy has contrived a machine for determining the duration of the effects of light, and after ſeveral trials, finds that it continues about eight thirds of a minute.

ACCIPENSER, in ichthyology, a genus of fiſhes belonging to the Amphibia Nantes of Linnæus. The accipenſer has a ſingle linear noſtril: the mouth is in the under part of the head, and contains no teeth; the cirri are below the ſnout, and before the mouth. There are three ſpecies of this genus, *viz.*

1. The ruthenus has 4 cirri, and 15 ſquamous protuberances. It is a native of Ruſſia.

2. The huſo has 4 cirri; the body is naked, *i. e.* has no prickles or protuberances. The ſkin of the huſo is ſo tough and ſtrong, that it is employed for ropes in carts and other wheel-carriages; and the ichthyocolla, or ISINGLASS of the ſhops, famous as an agglutinant, and uſed alſo for the fining of wines, is made from its ſound or ſcales. The ancients were acquainted with the fiſh that afforded this drug. The huſo is the largeſt of the genus, and grows to 24 feet in length. It inhabits the Danube and the rivers of Ruſſia.

3. The ſturio, or ſturgeon, with 4 cirri and 11 ſquamous protuberances on the back. This fiſh annually aſcends the rivers in Great Britain, but in no great numbers, and i ſtaken by accident in the ſalmon-nets. It ſeems a ſpiritleſs fiſh, making no manner of reſiſtance when entangled, but is drawn out of the water like a lifeleſs lump. It is ſeldom taken far out at ſea, but frequents ſuch parts as are not remote from the æſtuaries of great rivers. It is admired for the delicacy and firmneſs of its fleſh, which is white as veal, and extremely good when roaſted. It is generally pickled. A conſiderable quantity are annually ſent to Britain from America and the Baltic rivers. Great numbers are taken during ſummer in the lakes Friſchehaff, and Curiſch-haff near Pillau, in large nets made of ſmall cord. The adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen, ſome of which are rented for ſix thouſand guilders, or near three hundred pounds, *per annum*. They are found in vaſt abundance in the American rivers in May, June, and July; at which time they leap ſome yards out of the water, and, falling on their ſides, make a noiſe to be heard in ſtill weather at a great diſtance. Caviare is made of the roes of this, and alſo of all the other ſorts of ſturgeons, dried, ſalted, and pickled up cloſe. Ichthyocolla, or iſinglaſs, is likewiſe made of the ſound of this fiſh, as well as that of the others; but in very ſmall quantity The ſturgeon grows to a great ſize, to the length of 18 feet, and to the weight of 500 pounds. In the manner of breeding, this fiſh is an exception among the cartilaginous kind; being, like the bony fiſh, oviparous, ſpawning in water.

ACCIPITER, the name of Linnæus's firſt order of Birds. See ZOOLOGY.

Among the Romans, the term *accipiter* ſignified a hawk, and which, from its being very carnivorous, they conſidered as a bird of bad omen;

> *Odimus accipitrem, quia ſemper vivit in armis.* OVID.

Pliny, however, tells us, that in ſome caſes, particularly in marriage, it was eſteemed a bird of good omen, becauſe it never eats the hearts of other birds; intimating thereby, that no differences in a married ſtate ought to reach the heart. The accipiter was worſhipped as a divinity by the inhabitants of Tentyra, an iſland in the Nile, being conſidered by them as the image of the ſun; and hence we find that luminary repreſented, in hieroglyphics, under the figure of a hawk.

ACCISMUS, denotes a feigned refuſal of ſomething which a perſon earneſtly deſires. The word is Latin; or rather Greek, Ακκισμος; ſuppoſed to be formed from *Acco*, the name of a fooliſh old woman noted in antiquity for an affection of this kind.

Acciſmus is ſometimes conſidered as a virtue; ſometimes as a vice, which Auguſtus and Tiberius practiſed with great ſucceſs. Cromwell's refuſal of the crown of England may be brought as an inſtance of an Acciſmus.

ACCISMUS is more particularly uſed, in rhetoric, as a ſpecies of irony.

ACCITUM, (anc. geog.), a town of Hiſpania Bætica, now *Finiana*, as appears from an ancient inſcription; ſituate on an eminence of the mountains Alpuxaras in Granada.

ACCIUS (Lucius), a Latin tragic poet, the ſon of a freedman, and, according to St Jerome, born in the conſulſhip of Hoſtilius Mancinus and Attilius Serranus, in the year of Rome 583; but there appears ſomewhat of confuſion and perplexity in this chronology. He made himſelf known before the death of Pacuvius, a dramatic piece of his being exhibited the ſame year that Pacuvius brought one upon the ſtage, the latter being then eighty years of age, and Accius only thirty. We do not know the name of this piece of Accius's, but the titles of ſeveral of his tragedies are mentioned by various authors. He wrote on the moſt celebrated ſtories which had been repreſented on the Athenian ſtage; as Andromache, Andromeda, Atreus, Clytemneſtra, Medea, Meleager, Philoctetes, Accius, Acclamation.

the civil wars of Thebes, Tereus, the Troades, &c. He did not always, however, take his ſubjects from the Grecian ſtory; for he compoſed one dramatic piece wholly Roman: it was intitled *Brutus*, and related to the expulſion of the Tarquins. It is affirmed by ſome, that he wrote alſo comedies; which is not unlikely, if he was the author of two pieces, the Wedding and the Merchant, which have been aſcribed to him. He did not confine himſelf to dramatic writing; for he left other productions, particularly his annals, mentioned by Macrobius, Priſcian, Feſtus, and Nonnius Marcellus. He has been cenſured for writing in too harſh a ſtyle, but in all other reſpects has been eſteemed a very great poet. He was ſo much eſteemed by the public, that a comedian was puniſhed for only mentioning his name on the ſtage. Cicero ſpeaks with great deriſion of one Accius who had written a hiſtory; and, as our author had wrote annals, ſome inſiſt that he is the perſon cenſured; but as Cicero himſelf, Horace, Quintilian, Ovid, and Patroclus, have ſpoken of our author with ſo much applauſe, we cannot think it is him whom the Roman orator cenſures with ſo much ſeverity.

There was alſo in this age a pretty good orator of the ſame name, againſt whom Cicero defended Cluentius. He was born in Piſaurum, and perhaps was a relation of our poet.

ACCIUS, a poet of the 16th century, to whom is attributed *A Paraphraſe of Æſop's Fables*, on which Julius Scaliger beſtows great encomiums.

ACCLAMATION, a confuſed noiſe or ſhout of joy, by which the public expreſs their applauſe, eſteem, or approbation.

Acclamation, in a more proper ſenſe, denotes a certain form of words, uttered with extraordinary vehemence, and in a peculiar tone ſomewhat reſembling a ſong, frequent in the ancient aſſemblies. Acclamations were uſually accompanied with applauſes, with which they are ſometimes confounded: though they ought to be diſtinguiſhed; as acclamation was given by the voice, applauſe by the hands; add, that acclamation was alſo beſtowed on perſons abſent, applauſe only on thoſe preſent. Acclamation was alſo given by women, whereas applauſe ſeems to have been confined to men.

Acclamations are of various kinds; eccleſiaſtical, military, nuptial, ſenatorial, ſynodical, ſcholaſtic, theatrical, &c. We meet with loud acclamations, muſical, and rythmical acclamations; acclamations of joy and reſpect, and even of reproach and contumely. The former, wherein words of happy omen were uſed, were alſo called, *Laudationes, et bona vota*, or good wiſhes; the latter, *Execrationes et convicia*. Suetonius furniſhes an inſtance of this laſt kind in the Roman ſenate, on occaſion of the decree for demoliſhing the ſtatues of Domitian, when the fathers, as the hiſtorian repreſents it, could not refrain from contumelious acclamations of the deceaſed. The like were ſhown after the death of Commodus, where the acclamations run in the following ſtrain: *Hoſti patriæ honores detrahantur, parricidæ honores detrahantur; hoſtis ſtatuas undique, parricidæ ſtatuas undique, gladiatoris ſtatuas undique*, &c.—The formula, in acclamations, was repeated ſometimes a greater, ſometimes a leſſer, number of times. Hence we find in Roman writers, *acclamatum eſt quinquies, et vicies*; five times, and twenty times: ſometimes alſo *ſexagies*, and even *octuagies*; ſixty and eighty times.

Acclamation.

Acclamations were not unknown on the theatres in the earlieſt ages of the Roman commonwealth; but they were artleſs then, and little other than confuſed ſhouts. Afterwards they became a ſort of regular concerts. That mentioned by Phædrus, *lætare incolumis Roma ſalvo principe*, which was made for Auguſtus, and proved the occaſion of a pleaſant miſtake of a flute-player called *Princeps*, ſhows that muſical acclamations were in uſe in that emperor's reign. *Revertentem ex Provincia modulatis carminibus proſequebantur*, ſays Suetonius, who gives another inſtance in the time of Tiberius: a falſe report of Germanicus's recovery being ſpread through Rome, the people ran in crowds to the capitol with torches and victims, ſinging, *Salva Roma, Salva Patria, Salvus eſt Germanicus*.—Nero, paſſionately fond of muſic, took ſpecial care to improve and perfect the muſic of acclamations. Charmed with the harmony wherewith the Alexandrians, who came to the games celebrated at Naples, had ſung his praiſes, he brought ſeveral over to inſtruct a number of youth, choſen from among the knights and people, in the different kinds of acclamations practiſed at Alexandria. Theſe continued in uſe as long as the reign of Theodoric. But the people did not always make a ſingle chorus; ſometimes there were two, who anſwered each other alternately: thus, when Nero played on the theatre, Burrhus and Seneca, who were on either hand, giving the ſignal by clapping, 5000 ſoldiers called Auguſtals, began to chant his praiſe, which the ſpectators were obliged to repeat. The whole was conducted by a muſic-maſter called *Meſochorus* or *Pauſarius*.—The honour of acclamations was chiefly rendered to emperors, their children, and favourites; and to the magiſtrates who preſided at the games. Perſons of diſtinguiſhed merit alſo ſometimes received them, of which Quintilian gives us inſtances in Cato and Virgil. The moſt uſual forms were, *Feliciter, Longiorem vitam, Annos felices*. The actors themſelves, and they who gained the prizes in the games of the circus, were not excluded the honour of exclamations.

To theatrical exclamations may be added thoſe of the ſoldiery and people in time of triumph. The victorious army accompanied their general to the capitol; and, among the verſes they ſung in his praiſes, frequently repeated Io Triumphe, which the people anſwered in the ſame ſtrain. It was alſo in the way of acclamation, that the ſoldiers gave their general the title of *Imperator*, after ſome notable victory: a title which he only kept till the time of his triumph.

The acclamations of the ſenate were ſomewhat more ſerious than the popular ones; but aroſe from the ſame principle, *viz*. a deſire of pleaſing the prince or his favourites; and aimed likewiſe at the ſame end, either to expreſs the general approbation and zeal of the company, or to congratulate him on his victories, or to make him new proteſtations of fidelity. Theſe acclamations were uſually given after a report made by ſome ſenator, to which the reſt all expreſſed their conſent by crying, Omnes, Omnes; or elſe, *Æ*quum est, Justum est. Sometimes they began with acclamations, and ſometimes ended with them without other debates. It was after this manner that all the elections and proclamations of emperors, made by the ſenate, were conducted; ſomething of which practice is ſtill retained at modern elections of kings and emperors, where *Vivat*

Acclamation.

Rex, *Vive le Roy*, and *Long live the King*, are cuſtomary forms.

The Greeks borrowed the cuſtom of receiving their emperors in the public places from the Romans. Luitprand relates, that at a proceſſion where he was preſent, they ſung to the emperor Nicephorus, πολλα ετη; that is, Many years; which Codin expreſſes thus, by το ψαλλειν το πολυχρονιον, or by το πολυχρονιζειν; and the wiſh or ſalutation by πολυχρονισμα. And at dinner, the Greeks then preſent wiſhed with a loud voice to the emperor and Bradas, *Ut Deus annos multiplicet*; as he tranſlates the Greek. Plutarch mentions an acclamation ſo loud, upon occaſion of Flaminius's reſtoring liberty to Greece, that the very birds fell from heaven with the ſhout. The Turks practiſe ſomething like this on the ſight of their emperors and grand viziers to this day.

For the acclamations wherewith authors, poets, &c. were received, who recited their works in public; it is to be obſerved, the aſſemblies for this purpoſe were held with great parade in the moſt ſolemn places, as the capitol, temples, the Athenæum, and the houſes of great men. Invitations were ſent every where, in order to get the greater appearance. The chief care was, that the acclamations might be given with all the order and pomp poſſible. Men of fortune who pretended to wit, kept able applauders in their ſervice, and lent them to their friends. Others endeavoured to gain them by preſents and treats. Philoſtratus mentions a young man named Vavus, who lent money to the men of letters, and forgave the intereſt to ſuch as applauded his exerciſes. Theſe acclamations were conducted much after the ſame manner as thoſe on the theatre, both as to the muſic and the accompaniments: they were to be ſuited both to the ſubject and to the perſon. There were particular ones for the philoſophers, for orators, for hiſtorians, and for poets. It would be difficult to rehearſe all the forms of them; one of the moſt uſual was *Sophos*, which was to be repeated three times. Martial comprehends ſeveral other uſual forms in this verſe:

Graviter, Cito, Nequiter, Euge, Beate.

Neither the Greeks nor Romans were barren on this head. The names of gods and heroes were given thoſe whom they would extol. It was not enough to do it after each head of diſcourſe, chiefly after the exordium; but the acclamations were renewed at every fine paſſage, frequently at every period.

The acclamations wherewith the ſpectators honoured the victories of the athletæ, were a natural conſequence of the impetuous motions which attended the gymnaſtic games. The cries and acclamations of the people, ſometimes expreſſing their compaſſion and joy, ſometimes their horror and diſguſt, are ſtrongly painted by different poets and orators.

Acclamations made alſo a part of the ceremony of marriage. They were uſed for the omen's ſake; being the *Læta Omina*, ſometimes ſpoken of before marriage in Roman writers.

Acclamations, at firſt practiſed in the theatre, and paſſing thence to the ſenate, &c. was in proceſs of time received into the acts of councils, and the ordinary aſſemblies of the church. The people expreſſed their approbation of the preacher variouſly; the more uſual forms were, *Orthodox! Third Apoſtle!* &c. Theſe acclamations being ſometimes carried to exceſs, and often miſplaced, were frequently prohibited by the ancient doctors, and at length abrogated; though they appear to have been in ſome uſe as low as the time of St Bernard.

Acclamation || Accommodation.

Acclamation Medals, among antiquaries, ſuch as repreſent the people expreſſing their joy in the poſture of acclamation.

ACCLIVITY, the riſe or aſcent of a hill, in oppoſition to the declivity or deſcent of it. Some writers in fortification uſe it for the talus of a rampart.

ACCOLA, among the Romans, ſignified a perſon who lived *near* ſome place; in which ſenſe, it differed from *incola*, the *inhabitant* of ſuch a place.

ACCOLADE, a ceremony anciently uſed in the conferring of knighthood.

Antiquaries are not agreed wherein the accolade properly conſiſted. The generality ſuppoſe it to be the embrace, or kiſs, which princes anciently gave the new knight, as a token of their affection: whence the word *accolade*; *q. d.* a claſping, or taking round the neck. Others will rather have it to be a blow on the chine of the neck, given on the ſame occaſion. The Accolade is of ſome antiquity, in which ſoever of the two ſenſes it be taken. Greg. de Tours writes, that the kings of France, even of the firſt race, in conferring the gilt ſhoulder-belt, kiſſed the knights on the left cheek. For the *accoleé*, or blow, John of Saliſbury aſſures us, it was in uſe among the ancient Normans: by this it was that William the Conqueror conferred the honour of knighthood on his ſon Henry. At firſt, it was given with the naked fiſt; but was afterwards changed into a blow with the flat of the ſword on the ſhoulder of the knight.

ACCOLEE, ſometimes ſynonymous with Accolade, which ſee.—It is alſo uſed in various ſenſes in heraldry: ſometimes it is applied to two things joined; at other times, to animals with crowns, or collars about their necks, as the lion in the Ogilvy's arms; and, laſtly, to kews, battons, maces, ſwords, &c. placed ſaltierwiſe behind the ſhield.

ACCOLTI (Bernardo), ſecretary to the republic of Florence, was ſurnamed L'Unico, or the Nonſuch, probably from the great extent of his underſtanding, the variety of ſciences he had acquired, and the excellency of his poetic vein; which not only gained him a ſeat among the academicians of the court of Urbino, but made that great Mecænas, pope Leo X. in 1520, create him prince of the ſtate of Nepi. He wrote many pieces; among others, a collection of beautiful poems, printed at Venice in 1519 and 1553.

ACCOMMODATION, the application of one thing, by analogy, to another; or the making two or more things agree with one another.

To know a thing by *accommodation*, is to know it by the idea of a ſimilar thing referred thereto.

A prophecy of ſcripture is ſaid to be fulfilled various ways; properly, as when a thing foretold comes to paſs; and improperly, or by way of *accommodation*, when an event happens to any place or people, like to what fell out ſome time before to another.—Thus, the words of Iſaiah, ſpoken to thoſe of his own time, are ſaid to be fulfilled in thoſe who lived in our Saviour's; and are *accommodated* to them: "Ye hypocrites, well did Iſaias prophecy of you," &c. which ſame words St Paul afterwards *accommodates* to the Jews of his time.

The primitive church *accommodated* multitudes of Jewiſh, and even heathen ceremonies and practices, to Chriſtian purpoſes; but the Jews had before done the ſame by the Gentiles: ſome will even have circumciſion, the tabernacle, brazen ſerpent, &c. to have been originally of Egyptian uſe, and only *accommodated* by Moſes to the purpoſes of Judaiſm.* Spencer maintains, that moſt of the rites of the old law were an imitation of thoſe of the Gentiles, and particularly of the Egyptians; that God, in order to divert the children of Iſrael from the worſhip they paid to the falſe deities, conſecrated the greateſt part of the ceremonies performed by thoſe idolaters, and had formed out of them a body of the ceremonial law; that he had indeed made ſome alterations therein, as barriers againſt idolatry; and that he thus *accommodated* his worſhip to the genius and occaſions of his ancient people. To this condeſcenſion of God, according to Spencer,† is owing the origin of the tabernacle, and particularly that of the ark. Theſe opinions, however, have been controverted by later writers.

ACCOMPANIMENT, ſomething attending or added as a circumſtance to another, either by way of ornament, or for the ſake of ſymmetry.

Accompaniment, in muſic, denotes the inſtruments which accompany a voice, in order to ſuſtain it, as well as to make the muſic more full. The accompaniment is uſed in recitative, as well as in ſong; on the ſtage, as well as in the choir, &c. The ancients had likewiſe their accompaniments on the theatre; they had even different kinds of inſtruments to accompany the chorus, from thoſe which accompanied the actors in the recitation.—The accompaniment, among the moderns, is frequently a different part or melody from the ſong it accompanies. It is diſputed whether it was ſo among the ancients. It is generally alledged, that their accompaniments went no farther than the playing in octave, or in antiphony to the voice. The Abbé Fraguier, from a paſſage in Plato, pretends to prove, that they had actual ſymphony, or muſic in parts: but his arguments ſeem far from being concluſive.

Accompaniment, in painting, denotes ſuch objects as are added, either by way of ornament, or probability; as dogs, guns, game, &c. in a hunting-piece.

Accompaniment, in heraldry, any thing added to a ſhield by way of ornament; as the belt, mantling, ſupporters, &c. It is alſo applied to ſeveral bearings about a principal one; as a ſaltier, bend, feſs, chevron, &c.

ACCOMPLICE, one that has a hand in a buſineſs; or is privy in the ſame deſign or crime with another. See Accessory.

By the law of Scotland, the *accomplice* can only be proſecuted after the conviction of the *principal* offender, unleſs the acceſſion of the *accomplice* is immediate, in *ipſo actu*, ſo as in effect to render them *co-principal*. By the general rule, the *accomplice* ſuffers the ſame puniſhment with the *principal* offender; yet if he be remarkably leſs guilty, juſtice will not permit equal puniſhment.

The counſel of Sens, and ſeveral other ſynodical ſtatutes, expreſsly prohibit the revealing of *accomplices*.

ACCOMPLISHMENT, the entire execution or fulfilling of any thing.

Accomplishment, is principally uſed in ſpeaking of events foretold by the Jewiſh prophets in the Old Teſtament, and fulfilled under the New. We ſay a literal accompliſhment, a myſtical or ſpiritual accompliſhment, a ſingle accompliſhment, a double accompliſhment, a Jewiſh accompliſhment, a Chriſtian, a heathen accompliſhment. The ſame prophecy is ſometimes accompliſhed in all, or in ſeveral of thoſe different ways. Thus, of ſome of the prophecies of the Old Teſtament, the Jews find a literal accompliſhment in their own hiſtory, about the time when the prophecy was given: the Chriſtians find another in Chriſt, or the earlieſt days of the church; the heathens another, in ſome of their emperors; the Mahometans, another in their legiſlator, &c. There are two principal ways of accompliſhing a prophecy; *directly*, and by *accommodation*. See Accommodation, and Prophecy.

Accomplishment, is alſo uſed for any mental or perſonal endowment.

Accord, in painting, is the harmony that reigns among the lights and ſhades of a picture.

Accords (Stephen Tabourot, ſeigneur des), advocate in the parliament of Dijon in France, and king's advocate in the bailiwic and chancery of that city, born in the year 1549. He was a man of genius and learning; but too much addicted to trifles, as appears from his piece, intitled, "Les Bigarrures," printed at Paris in 1582. This was not his firſt production, for he had before printed ſome ſonnets. His work, intitled, "Les Touches," was publiſhed at Paris in 1585; which is indeed a collection of witty poems, but worked up rather in too looſe a manner, according to the licentious taſte of that age. His Bigarrures are written in the ſame ſtrain. He was cenſured for this way of writing, which obliged him to publiſh an apology. The lordſhip of Accords is an imaginary fief or title from the device of his anceſtors, which was a drum, with the motto, *à tous accords*, "chiming with all." He had ſent a ſonnet to a daughter of Mr Begat, the great and learned preſident of Burgundy, "who (ſays he) did me the honour to love me:—And inaſmuch (continues he), I had ſubſcribed my ſonnet with only my device, *à tous accords*, this lady firſt nicknamed me, in her anſwer, *Seigneur des Accords*; by which title her father alſo called me ſeveral times. For this reaſon I choſe this ſurname, not only in all my writings compoſed at that time, but even in theſe books." He died July 24th 1561, in the 46th year of his age.

ACCOUNT, or Accompt, in a general ſenſe, a computation or reckoning of any thing by numbers.—Collectively, it is uſed to expreſs the books which merchants, traders, bankers, &c. uſe for recording their tranſactions in buſineſs. See Book-keeping.

Chamber of Accounts, in the French polity, is a ſovereign court of great antiquity, which takes cogniſance of and regiſters the accounts of the king's revenue. It is nearly the ſame with the Engliſh *Court of Exchequer*.

Account is taken ſometimes, in a particular ſenſe, for the computation of time: thus we ſay, The Julian Account, the Gregorian Account, *&c.* in which ſenſe it is equivalent to *ſtyle*.

ACCOUNTANT, or Accomptant, in the moſt general ſenſe, is a perſon ſkilled in accounts. In a more reſtricted ſenſe, it is applied to a perſon, or officer, appointed to keep the accounts of a public company or office.

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* Saurin. Diſſ. O. T. tom. i.

† De legib. Hebr. diſſ. i. l. 3. p. 32.

ACCOUNTANTSHIP, the art of keeping and balancing accounts. See Book-keeping.

ACCOUNTANT-general, a new officer in the court of Chancery in Great Britain appointed by act of parliament to receive all moneys lodged in court inſtead of the maſters, and convey the ſame to the bank of England for ſecurity.

ACCOUTREMENT, an old term, applied to the furniture of a ſoldier, knight, or gentleman.

ACCRETION, in phyſics, the increaſe, or growth of an organical body, by the acceſſion of new parts. See Nutrition, Plants, and Vegetables.

Accretion, among civilians, the property acquired in a vague or unoccupied thing, by its adhering to or following another already occupied: thus, if a legacy be left to two perſons, one of whom dies before the teſtator, the legacy devolves to the ſurvivor by right of accretion.

ACCROCHE, in heraldry, denotes a thing's being hooked with another.

ACCUBATION, a poſture of the body, between ſitting and lying. The word comes from the Latin *accubare*, compounded of *ad*, to, and *cubo*, I lie down. *Accubation*, or *Accubitus*, was the table-poſture of the Greeks and Romans; whence we find the words particularly uſed for the lying, or rather (as we call it) ſitting, down to meat. The Greeks introduced this poſture. The Romans, during the frugal ages of the republic, were ſtrangers to it: but as luxury got footing, this poſture came to be adopted, at leaſt by the men; for as to women, it was reputed an indecency in them to lie down among the men: though, afterwards, this too was got over. But children did not lie down, nor ſervants, nor ſoldiers, nor perſons of meaner condition; but took their meals ſitting, as a poſture leſs indulgent. The Roman manner of diſpoſing themſelves at table was this: A low round table was placed in the cœnaculum, or dining-room; and, about this, uſually three, ſometimes only two, beds or couches; according to the number of which, it was called *biclinium* or *triclinium*. Theſe were covered with a ſort of bed-clothes, richer or plainer according to the quality of the perſon, and furniſhed with quilts and pillows, that the gueſts might lie the more commodiouſly. There were uſually three perſons on each bed; to crowd more, was eſteemed ſordid. In eating, they lay down on their left ſides, with their heads reſting on the pillows, or rather on their elbows. The firſt lay at the head of the bed, with his feet extended behind the back of the ſecond; the ſecond lay with the back of his head towards the navel of the firſt, only ſeparated by a pillow, his feet behind the back of the third; and ſo of the third, or fourth. The middle place was eſteemed the moſt honourable. Before they came to table, they changed their clothes, putting on what they called *cœnatoria veſtis*, the dining-garment; and pulled off their ſhoes, to prevent fouling the couch.

ACCUBITOR, an ancient officer of the emperors of Conſtantinople, whoſe buſineſs was to lie near the emperor. He was the head of the youth of the bed-chamber, and had the *cubicularius* and *procubitor* under him.

ACCUMULATION, in a general ſenſe, the act of heaping or amaſſing things together. Among lawyers it is uſed in ſpeaking of the concurrence of ſeveral titles to the ſame thing, or of ſeveral circumſtances to the ſame proof.

Accumulation of Degrees, in an univerſity, is the taking ſeveral of them together, or at ſmaller intervals than uſual, or than is allowed by the rules of the univerſity.

ACCURSED, ſomething that lies under a curſe, or ſentence of excommunication.

In the Jewiſh idiom *accurſed* and *crucified* were ſynonymous. Among them, every one was accounted *accurſed* who died on a tree. This ſerves to explain the difficult paſſage in Rom. ix. 3. where the apoſtle Paul wiſhes himſelf *accurſed after the manner of Chriſt*, *i. e.* crucified, if happily he might by ſuch a death ſave his countrymen. The prepoſition ἀπὸ here made uſe of, is uſed in the ſame ſenſe, 2 Tim. i. 3. where it obviouſly ſignifies *after the manner of*.

ACCURSIUS, a law-profeſſor in the 13th century, born in Florence. His authority was for ſome time ſo great, that he was called the Idol of the Lawyers.—Other three lawyers of note had the ſame name.

Accursius (Mariangelus), a famous critic of the 16th century, born at Aquilo in the kingdom of Naples. His Diatrebes, printed at Rome in folio, in 1524, on Ovid and Solinus, are a proof of his abilities in that kind of erudition. In his edition of Ammianus Marcellinus there are five books more than in any of the preceding ones; and he affirms he had corrected 5000 errors in that hiſtorian. His predominant paſſion was the ſearching for and collecting of old manuſcripts: yet he made Latin and Italian verſes; was complete maſter of the French, German, and Spaniſh tongues; and underſtood optics and muſic. He purged himſelf by oath, being charged for being a plagiary with regard to his Auſonius; it being reported, that he had appropriated to himſelf the labours of Fabricio Varana, biſhop of Camerino.

ACCUSATION, the charging any perſon with a criminal action, either in one's own name, or in that of the public. The word is compounded of *ad*, to; and *cauſari*, to plead.

Writers on politics treat of the benefit and the inconveniences of public accuſations. Various arguments are alleged, both for the encouragement and diſcouragement of accuſations againſt great men. Nothing, according to Machiavel, tends more to the preſervation of a ſtate, than frequent accuſations of perſons truſted with the adminiſtration of public affairs. This, accordingly, was ſtrictly obſerved by the Romans, in the inſtances of Camillus, accuſed of corruption by Manlius Capitolinus, *&c.* Accuſations, however, in the judgment of the ſame author, are not more beneficial than calumnies are pernicious; which is alſo confirmed by the practice of the Romans. Manlius not being able to make good his charge againſt Camillus, was caſt into priſon.

By the *Roman* law, there was no public accuſer for public crimes; every private perſon, whether intereſted in the crime or not, might accuſe, and proſecute the accuſed to puniſhment, or abſolution. Cato, the moſt innocent perſon of his age, had been accuſed 42 times, and as often abſolved. But the accuſation of *private* crimes was never received but from the mouths of thoſe who were immediately intereſted in them: None (*e.g.*) but the huſband could accuſe his wife of adultery.

The ancient Roman lawyers diſtinguiſhed between *poſtulatio*, *delatio*, and *accuſatio*. For, firſt, leave was deſired to bring a charge againſt one, which was called *poſtulare:* then he againſt whom the charge was laid, was brought before the judge; which was called *deferre*, or *nominis delatio:* laſtly, the charge was drawn up and preſented, which was properly the *accuſatio*. The accuſation properly commenced, according to Pædianus, when the *reus* or party charged, being interrogated, denied he was guilty of the crime; and ſubſcribed his name to the *delatio* made by his opponent.

In the *French* law, none but the Procureur general, or his deputies, can form an accuſation, except for high-treaſon and coining, where accuſation is open to every body. In other crimes, private perſons can only act the part of denouncers, and demand reparation for the offence, with damages.

In *Britain*, by Magna Charta, no man ſhall be impriſoned or condemned on any accuſation, without trial by his peers, or the law; none ſhall be vexed with any accuſation, but according to the law of the land; and no man may be moleſted by petition to the king, &c. unleſs it be by indictment or preſentment of lawful men, or by proceſs at common law. Promoters of ſuggeſtions, are to find ſurety to purſue them; and if they do not make them good, ſhall pay damages to the party accuſed, and alſo a fine to the king. No perſon is obliged to anſwer upon oath to a queſtion whereby he may accuſe himſelf of any crime.

ACCUSATIVE, in the Latin grammar, is the fourth caſe of nouns, and ſignifies the relation of the noun on which the action implied in the verb terminates; and hence, in ſuch languages as have caſes, theſe nouns have a particular termination, called *accuſative:* as, *Auguſtus vicit Antonium*, Auguſtus vanquiſhed Antony. Here *Antonium* is the noun, on which the action implied in the verb *vicit* terminates; and, therefore, muſt have the accuſative termination. Ovid, ſpeaking of the palace of the ſun, ſays, *Materiem ſuperabat opus*, The work ſurpaſſed the materials. Here *materiem* has the accuſative termination; becauſe it determines the action of the verb *ſuperabat*.—In the Engliſh language there are no caſes, except the genitive; the relation of the noun being ſhown by the aſſiſtance of prepoſitions, as *of*, *to*, *from*, &c.

ACCUSIORUM COLONIA (anc. geog.), an inland town in the Cavares, in Gallia Narbonenſis: now *Grenoble*, in Dauphiné. See GRENOBLE.

ACE, among gameſters, a card or die marked only with one point.

ACELUM, or ACELIUM (anc. geog.), a town of the Venetian territory, now called *Azolo*, ſituated to the weſt of Trevigi, at the ſource of the rivulet Muſone. E. Long. 13°. N. Lat. 45°.

ACENTETUM, or ACANTETA, in natural hiſtory, a name given by the ancients to the pureſt and fineſt kind of rock-cryſtal: They uſed the cryſtal in many ways; ſometimes engraving on it, and ſometimes forming it into vaſes and cups, which were held next in value to the *vaſa murrhina* of theſe times. The cryſtal they obtained from the iſland of Cyprus was much eſteemed; but often faulty in particular parts, having hairs, cracks, and foulneſſes, which they called *ſalts*, in the middle of the large pieces. Pliny tells us, that when it was uſed for engraving on, the artiſt could conceal all theſe blemiſhes among the ſtrokes of his work; but when it was to be formed into cups or precious vaſes, they always choſe the acentetum which had no flaws or blemiſhes.

ACEPHALI, or ACEPHALITÆ, a term applied to ſeveral ſects who refuſed to follow ſome noted leader. Thus the perſons who refuſed to follow either John of Antioch, or St Cyril, in a diſpute that happened in the council of Epheſus, were termed *Acephali*, without a head or leader. Such biſhops, alſo, as were exempt from the juriſdiction and diſcipline of their patriarch, were ſtiled *Acephali*.

ACEPHALI, the levellers in the reign of king Henry I. who acknowledged no head or ſuperior. They were reckoned ſo poor, that they had not a tenement by which they might acknowledge a ſuperior lord.

ACEPHALOUS, or ACEPHALUS, in a general ſenſe; without a head.

The term is more particularly uſed in ſpeaking of certain nations, or people, repreſented by ancient naturaliſts and coſmographers, as well as by ſome modern travellers, as formed without heads; their eyes, mouths, &c. being placed in other parts.

Such are the Blemmyes, a nation of Africa near the head of the Niger, repreſented to be by Pliny and Solinus; *Blemmyes traduntur capita abeſſe, ore et oculis pectore affixis*. Cteſias and Solinus mention others in India near the Ganges, *ſine cervice, ocules in humeris habentes*. Mela alſo ſpeaks of people, *quibus capita et vultus in pectore ſunt*. And Suidas, Stephanus Byzantinus, Vopiſcus, and others after them, relate the like. Some modern travellers ſtill pretend to find acephalous people in America.

Several opinions have been framed as to the origin of the fable of the Acephali. The firſt is that of Thomas Bartholin, who turns the whole into a metaphor; being convinced, that the name Acephali was anciently given to ſuch as had leſs brain, or conducted themſelves leſs by the rules of prudence, than others. Olearius rather apprehends, that the ancient voyagers, viewing certain barbarous people from the coaſts, had been impoſed on by their uncouth dreſs; for that the Samogitians, being ſhort of ſtature, and going in the ſeverity of winter with their heads covered in hoods, ſeem at a diſtance as if they were headleſs. F. Laſitau ſays, that by Acephali are only meant, people whoſe heads are ſunk below their ſhoulders. In effect, Hulſius, in his epitome of Sir Walter Raleigh's voyage to Guaiana, alſo ſpeaks of a people which that traveller found in the province of Irvipanama, between the lakes of Panama and Caſſipa, who had no head or neck; and Hondius, in his map, marks the place with the figures of theſe monſters. Yet De Laet* rejects the ſtory; being informed by others, that the inhabitants of the banks of the Caora, a river that flows out of the lake of Caſſipa, have their heads ſo far ſunk between their ſhoulders, that many believed they had their eyes in their ſhoulders and their mouths in their breaſts.

But though the exiſtence of a nation of *Acephali* be ill warranted, naturaliſts furniſh ſeveral inſtances of individuals born without heads, by ſome luſus or aberration of nature. Wepfer gives† a catalogue of ſuch acephalous births, from Schenckius, Licetus, Paræus, Wolfius, Mauriceau, &c.

ACEPHALUS, an obſolete term for the tænia or tape-worm, which was long ſuppoſed to be acephalous. See TÆNIA. The firſt who gave it a head was Tulpius; and after him, Fehr: The former even makes it *biceps*, or two-headed.

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* Deſcript. Amer. l. 17. c. 22.

† In Eph. Ger. dec. 1. an. 3. obſ. 129. p. 184. Dec. 2. an. 9. obſer. 148. p. 258.

ACEPHALUS, is alſo uſed to expreſs a verſe defective in the beginning.

ACER, the MAPLE or SYCAMORE TREE: a genus of the monœcia order, belonging to the polygamia claſs of plants; and ranked under the 23d Natural Order, *Trihilatæ*.—The generic characters, both natural and eſſential, are: The HERMAPHRODITE *calyx* is an acute, coloured, one-leav'd perianthium, divided into five ſegments, flat and entire at the baſe, and perſiſtent: The *corolla* is five-petal'd, ovate, and expanding: The *ſtamina* conſiſts of eight ſubulated ſhort filiments; the antheræ ſimple, the duſt cruciform: The *piſtillum* has a compreſſed germen, immerſed in the receptacle, which is convex, perforated, and large; the ſtylus is filiform; the ſtigmata are two, pointed, ſlender, and reflex: The *pericarpium* conſiſts of two or three capſulæ uniting at the baſe, roundiſh, compreſſed, each terminated with a large membranous wing: The *ſeeds* are ſolitary and roundiſh. The MALE *calyx*, *corolla*, and *ſtamina*, are the ſame as in the hermaphrodite: The *piſtillum* has no germen, nor ſtylus; the ſtigma is bifid. [*Nota*, On the firſt opening of the flower, the *ſtigma* alone appears; a few days after, the *ſtylus*.—The hermaphrodite flowers on the ſame umbel are frequently of two ſorts: the inferior ones *feminine*, the antheræ of which do not burſt, but the piſtillum quickly grows into a fruit: the ſuperior ones *maſculine*, of which the antheræ ſcatter their pollen, but the piſtilla without increaſing fall off.]

Species, with their uſes and properties.] 1. The pſeudo-platanus, or ſycamore, is a very large and beautiful tree, with broad leaves, divided into five lobes ſerrated in their edges; of a dark-green colour on the upper ſide, but paler and ſomewhat hoary underneath; the flowers are very ſmall, and of a greeniſh white colour. The corolla of this ſpecies is ſcarcely diſtinguiſhable from the calyx, and the ſtamina are long. The fruit is large, and beautifully variegated with green and purple. This ſpecies is a native of Germany, but thrives very well in Great Britain, where it is frequent in plantations. It is very proper for making plantations near the ſea, or ſheltering ſuch as are already too near it; becauſe the ſycamore-tree reſiſts the ſpray of the ocean much better than moſt other trees. But it has this inconvenience, that its leaves are devoured by inſects, ſo as to become full of holes, and very unſightly; which has cauſed the planting of it to be much neglected of late. It has, however, long been conſidered as a timber tree, having been much uſed by the turners for wooden bowls, diſhes, trenchers, &c.; but, ſince the cuſtom of uſing earthen ware has become ſo prevalent, its value for thoſe purpoſes has greatly decreaſed. There are two varieties, one with broad leaves and large keys, the other with variegated leaves. By tapping it yields a liquor not unlike that of the birch-tree; from which the Highlanders of Scotland ſometimes make an agreeable and wholeſome wine.

2. The campeſtris, or common maple, is too well known to need any particular deſcription, as it grows very frequently in hedge-rows in moſt parts of Britain. The timber of the common maple is far ſuperior to the beech for all the uſes of the turner. When it abounds with knots, as it frequently does, it is highly eſteemed by joiners for inlayings. It is alſo frequently employed for making muſical inſtruments, on account of its lightneſs; and for the whiteneſs of its wood was formerly eſteemed for making tables, &c. But the principal value of the maple is for underwood; it being of a quick growth, and affording good fuel.

3. The negundo, or Virginia aſh-leaved maple, is a very ſtrong ſhooting tree; and in Virginia, where it is a native, is one of the largeſt trees of this kind. Its leaves are of a pale green, and well adapted to give a variety of tint; but Hanbury ſays, that this tree ought not to be planted in expoſed ſituations, the branches being ſubject to be ſplit off by the wind. Its uſes are ſimilar to thoſe of the ſycamore.

4. The platanoides, or Norway-maple, grows naturally in Norway, Sweden, and other northern countries of Europe. It riſes to a good height, and is well furniſhed with branches, with ſmooth leaves of a ſhining green colour, and beautifully indented. Theſe have an acrid milky juice, which prevents them from being preyed upon by inſects as the ſycamore is; and as this ſpecies reſiſts the ſpray of the ſea equally with the firſt, it is preferable in plantations ſituated near the ſea. In autumn the leaves dye to a golden yellow colour, which cauſes a delightful effect at that ſeaſon when the different tints of decaying vegetables are diſplayed. The flowers are alſo beautiful; they come out early in the ſpring, are of a fine yellow colour, and ſhow themſelves to advantage before the leaves come out. They are frequently ſucceeded by keys, which ſometimes arrive at maturity in Britain. There is a variety with ſtriped leaves.

5. The rebrum, or Virginia ſcarlet flowering maple, is a native of that country, and never grows to a large ſize in Britain. It is, however, cultivated in gardens for the beauty of its flowers, which appear in the beginning of April, in roundiſh bunches, at the bottom of the footſtalks of the leaves. The ſeeds are ripe in five or ſix weeks after; and ought to be immediately ſown, being otherwiſe very apt to periſh. The tree ought to be ſheltered, eſpecially whilſt young, from the north-eaſt winds; it delights in a moiſt light ſoil, where it will thrive much better, as well as produce many more flowers and much better ſeeds, than in a dry ground. A variety of this tree is known in England by the name of *Sir Charles Wager's Flowering Maple*, from its being firſt ſent from America to Sir Charles Wager. The flowers of this kind come out in larger cluſters than the other, and ſurround the ſmall branches, ſo that the tree appears entirely covered with them, and makes a much more beautiful appearance than the former, which is now not ſo much eſteemed.

6. The ſaccharinum, or ſugar-maple, is a large growing tree; will arrive at the height of 40 feet; and has broad thin leaves, divided into five principal parts; which are again indented or cut at the edges into ſeveral acute ſegments. Their ſurface is ſmooth, of a light green colour, whitiſh underneath; and they grow on pretty long footſtalks. The flowers come out in the ſpring, about the time of the Norway maple; and they are ſucceeded by long keys, which ſometimes ripen in England. In America, the inhabitants tap this tree in the ſpring, boil the liquor, and the feces af-

ford uſeful ſugar. The ſycamore, the aſh-leaved, and the Norway maples, alſo abound with a ſaccharine juice, from which there is no doubt but a uſeful ſugar might be prepared.

7. The Penſylvanicum, or American mountain-maple, very much reſembles the ſugar-maple, only its leaves are more pointed.

8. The opalus, or Italian maple, is very common in moſt parts of Italy, particularly about Rome; but in Britain is very rarely to be met with, though hardy enough to bear the open air. It is one of the largeſt ſpecies of trees in Italy, and affords a great ſhade by its numerous and large leaves. On this account it is planted on the road-ſides, and near habitations.

9. The monſpeſulanum, or Montpelier maple, is common in the ſouth of France, and in Italy; but is hardly met with in Britain. The leaves reſemble thoſe of the common maple; but are of a much thicker ſubſtance, a ſhining green colour, and not ſo large. They continue in verdure very late in the autumn, which renders the trees more valuable.

10. The creticum, or Cretan maple, grows naturally in the Levant; it ſomewhat reſembles the laſt ſpecies; but its leaves are of a much thinner texture, and their footſtalks covered with a ſoft hairy down; whereas thoſe of the other are ſmooth and ſoft.

Propagation and culture.]—1. By *ſeeds.* The firſt four ſpecies are eaſily propagated in this way. The keys, when ripe in autumn, may be gathered, and in a few days after ſown, about an inch and an half deep, in beds of common mould. In ſpring the plants will appear, and make a ſhoot of about a foot and an half by the autumn following, if the ground of the ſeminary be tolerably good, and they are kept free from weeds. The ſpring after they come up they ſhould be planted in the nurſery in rows of two feet and an half aſunder, and their diſtance in the rows muſt be one foot and an half. Here they may remain till they are big enough to plant out finally, with no further trouble than taking off unſightly ſide-branches, and ſuch as have a tendency to make the tree forked, except digging between the rows, which muſt always be done every winter.——For the other ſpecies, their ſeeds, as they do not ripen in this country, ought to be procured from the places where they naturally grow, and managed in the following manner: A cool ſhady part of the ſeminary ſhould be appropriated for the purpoſe; the mould ſhould be made fine; beds ſhould be marked out four feet wide, and in length proportionable to the quantity; and in theſe the ſeeds ſhould be regularly ſown, ſifting over them about half an inch of the fineſt mould. When the plants come up, they muſt be kept clean from weeds, and frequently watered; and this work muſt be duly attended to all ſummer. The next ſpring, the ſtrongeſt may be drawn out, and planted in the nurſery, in rows two feet aſunder, and at the diſtance of a foot from each other in the rows; leaving the others in the ſeminary to gain ſtrength. The ſpring following they alſo muſt receive the ſame culture; and in the nurſery they may remain, with no other trouble than keeping the ground clean from weeds in the ſummer, digging between the rows in the winter, and taking off all ſtrong and irregular ſide-ſhoots till they are planted out. Trees raiſed from ſeeds will grow faſter, and arrive at greater height, than thoſe raiſed from layers: but they will not produce ſuch quantities of flowers; which makes the latter method more eligible for thoſe who want theſe plants for a low ſhrubbery.—Seeds of the variegated kinds alſo, when ſown, will produce variegated plants in return; which renders the propagation of theſe ſorts very expeditious where plenty of ſeeds may be had. Where theſe are not to be obtained, the plants are propagated by budding, as afterwards directed.

2. By *layers.* All the ſpecies may be propagated by this method; though it is never practiſed for the common maple and the ſycamore. The young ſhoots may be at any time laid down in the autumn, winter, or early in the ſpring. By the autumn following, they will have ſtruck root, and become good plants; when the ſtrongeſt may be ſet out in the places where they are to remain; whilſt the weakeſt may be planted in the nurſery, like the ſeedlings, for a year or two, to acquire ſtrength.

3. By *cuttings:* which method, however, is chiefly practiſed on the aſh-leaved and Norway maples, which more readily take root this way. The cuttings ſhould be the bottom parts of the laſt year's ſhoots: They ſhould be taken off early in October, and planted in rows in a moiſt ſhady place. The ſpring and ſummer following, they muſt be duly watered as often as dry weather makes it neceſſary, and be kept clean from weeds. By the autumn they will be fit to remove into the nurſery; though if the cuttings are not planted too cloſe, they may remain in their ſituation for a year or two longer, and then be ſet out finally, without the trouble of being previouſly planted in the nurſery.

4. By *budding, grafting,* and *inarching.* Theſe methods are only practiſed for the variegated ſorts and the large broad-leaved kind. The latter is to be continued no otherwiſe than by budding it on ſtocks of the common ſycamore; for from the ſeeds, though ſo large themſelves, only the common ſycamore is produced.

In order to propagate theſe varieties by budding, let ſome plants of the common ſycamore, one year old, be taken out of the ſeminary, and ſet in the nurſery in rows a yard aſunder, and the plants about a foot and a half diſtance from each other in the rows: Let the ground be kept clean from weeds all ſummer, and *turned in* in the winter; and the ſummer following the ſtocks will be of a proper ſize to receive the buds, which ſhould be taken from the moſt beautifully-ſtriped branches. The beſt time for this work is the middle or latter end of Auguſt. Having then budded your ſtocks with the eyes or buds fronting the north, early in October take off the baſs-matting, which before this time will have confined the bark and pinched the bud, but not ſo as to hurt it much. Then cut off the ſtock juſt above the bud, and dig the ground between the rows. The ſummer following, keep the ground clean from weeds; cut off all natural ſide-buds from the ſtock as they come out; and by autumn, if the land is good, the buds will have ſhot forth, and formed themſelves into trees five or ſix feet high. They may be then removed into the places where they are deſigned to remain; or a few of them only may be drawn out, leaving the others to be trained up for larger ſtandards. The ſtriped Norway maple ſhould be budded on ſtocks of its own kind; for on theſe they take beſt, and both kinds are not very liable to run away from their colours. Variegated plants in general muſt be planted in poor, hungry, gravelly, or ſandy ſoils, to feed the diſeaſe which occaſions theſe beautiful ſtripes, and cauſe it to be more powerful. But theſe trees ſhow their ſtripes in greater perfection in a good ſoil: The plant, though in ſickneſs, has the appearance of health; the ſhoots are vigorous and ſtrong; the leaves are large, leſs liable to be hurt by inſects; and the ſtripes appear more perfect, natural, and beautiful, than thoſe on ſtunted trees growing on a poor ſoil.

ACERB, a ſour rough aſtringency of taſte, ſuch as that of unripe fruit.

ACERNO, a town of Italy, in the citerior principality of Naples, with a biſhop's ſee. E. long. 15. 46. N. lat. 40. 50.

ACERINA, in Ichthyology, a name given by Pliny and other of the old naturaliſts, to the fiſh we at this time call the *ruffe*. See PERCA.

ACERRA, in antiquity, an altar erected, among the Romans, near the bed of a perſon deceaſed, on which his friends daily offered incenſe till his burial.—The real intention probably was to overcome any offenſive ſmell that might ariſe about the corpſe. The Chineſe have ſtill a cuſtom like this: They erect an altar to the deceaſed in a room hung with mourning; and place an image of the dead perſon on the altar, to which every one that approaches it bows four times, and offers oblations and perfumes.

The *Acerra* alſo ſignified a little pot wherein were put the incenſe and perfumes to be burnt on the altars of the gods and before the dead. It appears to have been the ſame with what was otherwiſe called *thuribulum*, and *pyxis*.

We find mention of *Acerræ* in the ancient church. The Jews had alſo their *Acerræ* in our verſion rendered *cenſers;* and the Romaniſts ſtill retain them under the name of *incenſe-pots*. In Roman writers, we frequently meet with *plena acerra*, a full acerra: to underſtand which, it is to be obſerved, that people were obliged to offer incenſe in proportion to their eſtate and condition; the rich in larger quantities, the poor only a few grains; the former poured out *acerras* full on the altar, the latter took out two or three bits with their fingers.

ACERRA, a town of Italy, in the kingdom of Naples, and in the Terra di Lavoro; ſeated on the river Agno. E. Long. 15. 10. N. lat. 40. 55.

ACERRÆ (anc. geog.), the ancient name of a town on the Clanius, in Campania, not far from Naples, now ACERRA.—The name alſo of another town, now called *la Girola*, in the territory and to the ſouth-eaſt of Lodi, where the rivulet Serio falls into the Adda, to the weſt of Cremona and north of Placentia.

ACESCENT, a word uſed to denote any thing which is turning ſour, or which is ſlightly acid. It is only applied properly to the former of theſe two meanings. The ſecond may be expreſſed by either of the two words, *acidulous* or *ſub-acid*.

ACETABULUM, in antiquity, a meaſure uſed by the ancients, equal to one-eighth of our pint. It ſeems to have acquired its name from a veſſel in which acetum or vinegar was brought to their tables, and which probably contained about this quantity.

ACETABULUM, in anatomy, a cavity in any bone for receiving the protuberant head of another, and thereby forming that ſpecies of articulation called ENARTHROSIS.

ACETABULUM, in botany, the trivial name of a ſpecies of the peziza, or cup-peziza, a genus belonging to the cryptogamia fungi of Linnæus. It has got the name of *acetabulum*, from the reſemblance its leaves bear to a cup. See PEZIZA.

ACETARY. Nehemiah Grew, in his anatomy of plants, applies the term to a pulpy ſubſtance in certain fruits, *e. g.* the pear, which is incloſed in a congeries of ſmall calculous bodies towards the baſe of the fruit, and is always of an acid taſte.

ACETOSA, Sorrel; by Linnæus joined to the genus of Dock, under the title of *Rumex*. See RUMEX.

ACETOSELLA, in botany, a ſpecies of OXALIS.

ACETOUS, an epithet applied to ſuch ſubſtances as are ſour or partake of the nature of vinegar.

ACETUM, VINEGAR, the vegetable ACID of the chemiſts. See VINEGAR.

ACHABYTUS (anc. geog.), a high mountain in Rhodes, on the top of which ſtood a Temple of Jupiter.

ACHÆA (anc. geog.), a town of the iſland of Rhodes, in the diſtrict of Jalyſus, and the firſt and moſt ancient of all, ſaid to be built by the Heliades, or Grandſons of the Sun.

ACHÆA, a hamlet of Aſiatic Sarmatia on the Euxine. The inhabitants were called *Achæi*, a cloony of the Orchomenians.

ACHÆANS, the inhabitants of ACHAIA Propria, a Peloponneſian ſtate. This republic was not conſiderable in early times, for the number of its troops, nor for its wealth, nor for the extent of its territories; but it was famed for its probity, its juſtice, and its love of liberty. Its high reputation for theſe virtues was very ancient. The Crotonians and Sybarites, to re-eſtabliſh order in their towns, adopted the laws and cuſtoms of the Achæans. After the famous battle of Leuctra, a difference aroſe betwixt the Lacedamonians and Thebans, who held the virtue of this people in ſuch veneration that they terminated the diſpute by their deciſion. The government of the Achæans was democratical. They preſerved their liberty till the time of Philip and Alexander: But in the reign of thoſe princes, and afterwards, they were either ſubject to the Macedonians, who had made themſelves maſters of Greece, or oppreſſed by cruel tyrants. The Achæan commonwealth conſiſted of twelve inconſiderable towns in Peloponneſus. Its firſt annals are not marked by any great action, for they are not graced with one eminent character. After the death of Alexander, this little republic was a prey to all the evils which flow from political diſcord. A zeal for the good of the community was now extinguiſhed. Each town was only attentive to its private intereſt. There was no longer any ſtability in the ſtate; for it changed its maſters with every revolution in Macedonia. Towards the 124th Olympiad, about the time when Ptolmey Soter died, and when Pyrrhus invaded Italy, the republic of the Achæans recovered its old inſtitutions and unanimity. The inhabitants of Patæ and of Dymæ were the firſt aſſerters of ancient liberty. The tyrants were baniſhed, and the towns again made one commonwealth. A public council was then held, in which affairs of importance were diſcuſſed and determined. A regiſter was appointed to record the tranſactions of the council. This aſſembly had two preſidents, who were nominated alternately by the different towns. But inſtead of two preſidents, they ſoon elected but one. Many neighbouring towns which admired the conſtitution of this republic, founded on equality, liberty, the love of juſtice, and of the public good, were incorporated with the Achæans, and admitted to the full enjoyment of their laws and privileges.—The arms which the Achæans chiefly uſed were ſlings They were trained to the art from their infancy, by ſlinging from a great diſtance, at a circular mark of a moderate circumference. By long practice they took ſo nice an aim, that they were ſure, not only to hit their enemies on the head, but on any part of the face they choſe.—Their ſlings were of a different kind from thoſe of the Balearians, whom they far ſurpaſſed in dexterity.

ACHÆI, (Achæans) ; the inhabitants of Achaia Propria. In Livy, the people of Greece ; for the moſt part called *Achivi*, by the Roman poets. In Homer, the general name for Grecians. See ACHÆANS.

ACHÆORUM PORTUS, (Pliny) ; now *Porto Buon*, a harbour of the Cherſoneſus Taurica, on the Euxine. Another, near Sigæum, into which the Xanthus, after being joined by the Simois, falls.

ACHÆMENES, according to Herodotus, was father of Cambyſes, and grandfather of Cyrus the firſt, king of Perſia. Moſt of the commentators of Horace are of opinion, that the Achæmenes whom that poet mentions, ode xii. of his 2d book, was one of the Perſian monarchs : but, if that were true, he muſt have reigned before the Medes ſubdued the Perſians ; for we do not hear of any king of that name from the time that the Perſians founded that great monarchy, which is looked upon as the ſecond univerſal one. However this be, the epithet *Achæmenians* is frequently given to the Perſians, in the old Latin poets.

ACHÆMENES, ſon of Darius I. king of Perſia, and brother of Xerxes, had the government of Egypt beſtowed on him, after Xerxes had forced the Egyptians to return to their allegiance. He ſome time after commanded the Egyptian fleet in the celebrated expedition which proved ſo fatal to all Greece. The Egyptians having again taken up arms after the death of Xerxes, Achæmenes was ſent into Egypt to ſuppreſs the rebellion ; but was vanquiſhed by Inarus, chief of the rebels, ſuccoured by the Athenians.

ACHÆUS, couſin-german to Seleucus Ceraunus and Antiochus the Great, kings of Syria, became a very powerful monarch, and enjoyed the dominions he had uſurped for many years ; but at laſt he was puniſhed for his uſurpations in a dreadful manner, in the 140th year of Rome, as related by Polybius.*

* Lib. viii. cap. 5. 6.

ACHAIA, a name taken for that part of Greece which Ptolemy calls *Hellas* ; the younger Pliny, *Græcia* ; now called *Livadia* : bounded on the north by Theſſaly, the river Sperchius, the Sinus Maliacus, and mount Oeta ; on the weſt by the river Achelous ; on the eaſt, turning a little to the north, it is waſhed by the Archipelago, down to the promontory of Sunium : on the ſouth, joined to the Peloponneſus, or Morea, by the iſthmus of Corinth, five miles broad.

ACHAIA Propria, anciently a ſmall diſtrict in the north of Peloponneſus, running weſtward along the bay of Corinth, and bounded on the weſt by the Ionian Sea, on the ſouth by Elis and Arcadia, and on the eaſt by Sicyonia : inhabitants, the *Achæans*, properly ſo called ; its metropolis, *Patræ*. It is now called *Romania Alta*, in the Morea.

Achaia was alſo taken for all thoſe countries that joined in the Achæan league, reduced by the Romans to a province. Likewiſe for Peloponneſus.

ACHAIÆ Preſbyteri, or the Preſbyters of Achaia, were thoſe who were preſent at the martyrdom of St. Andrew the Apoſtle, A. D. 59 ; and are ſaid to have written an epiſtle in relation to it. Bellarmin, and ſeveral other eminent writers in the church of Rome, allow it to be genuine ; while Du Pin, and ſome others, expreſsly reject it.

ACHAIUS, ſon of Ethwin, was raiſed to the crown of Scotland, A. D. 788. The emperor Charlemagne ſent an embaſſy to deſire an alliance with him againſt the Engliſh, whoſe pirates ſo infeſted the ſeas, that the merchants could not carry on their trade. This alliance was concluded in France upon conditions ſo advantageous to the Scots, that Achaius, to perpetuate the memory of it, added to the arms of Scotland a double field ſowed with lilies. He died in 819.

ACHALALACTLI, in ornithology, a ſpecies of king's-fiſher. See ALCEDO.

ACHAN, the ſon of Carmi, of the tribe of Judah, at the taking of Jericho concealed two hundred ſhekels of ſilver, a Babyloniſh garment, and a wedge of gold, contrary to the expreſs command of God. This ſin proved fatal to the Iſraelites, who were repulſed at the ſiege of Ai. In this dreadful exigence, Joſhua proſtrated himſelf before the Lord, and begged that he would have mercy upon his people. Achan was diſcovered by caſting lots, and he and his children were ſtoned to death. This expiation being made, Ai was taken by ſtratagem. Joſh. vii. 8, 9.

ACHANE, an ancient Perſian corn meaſure, containing 45 Attic medimni.

ACHARACA, anciently a town of Lydia, ſituate between Trulles and Nyſa ; in which were the temple of Pluto, and the cave Charonium, where patients ſlept in order to obtain a cure.

ACHAT, in law, implies a purchaſe or bargain. And hence probably purveyors were called *Achators*, from their making bargains.

ACHATES, the companion of Eneas, and his moſt faithful friend, celebrated in Virgil.

ACHATES, in natural hiſtory. See AGATE.

ACHATES (anc. geog.), a river of Sicily, now the *Drillo* ; which runs from north to ſouth, almoſt parallel with, and at no great diſtance from, the Gela ; and riſes in the north of the territory of Noto. It gave name to the Achates, or Agate, ſaid to be firſt found there.

ACHAZIB, or ACHZIB (anc. geog.), a town of Galilee, in the tribe of Aſher, nine miles from Ptolemais.—Alſo a town in the more ſouthern parts of the tribe of Judah.

ACHEEN, ACHE', or ACHEN, a kingdom of Sumatra in the Eaſt Indies, ſituated on the north-weſtern part of the iſland.

The capital is ſituated on a river which empties itſelf near the north-weſt point, or Acheen-head, about two miles from the mouth. It lies in a wide valley, formed like an amphitheatre by two lofty ranges of hills. The river is not large, and by emptying itſelf in ſeveral channels is rendered very ſhallow at the bar. In the dry monſoon it will not admit boats of any burthen, much leſs large veſſels, which lie without, in the road formed by the iſlands off the point. Though no longer the great mart of eaſtern commodities, it ſtill carries on a conſiderable trade with the natives of that part of the coaſt of Indoſtan called *Telinga,* who ſupply it with the cotton goods of their country, and receive in return, gold-duſt, ſapan-wood, betel-nut, patch-leaf *(colſus Indicus),* a little pepper, ſulphur, camphire, and benzoin. The country is ſupplied with Bengal opium, and alſo with iron, and many other articles of merchandize, by the European traders.

Acheen is eſteemed, comparatively, healthy, being more free from woods and ſwamps than moſt other portions of the iſland; and the fevers and dyſenteries to which theſe are ſuppoſed to give occaſion, are there ſaid to be uncommon. The ſoil is light and fertile; and the products, beſide thoſe already enumerated as articles of export trade, and a variety of fine fruits, are chiefly rice and cotton. There is likewiſe ſome raw ſilk procured in the country, of very inferior quality. Gold duſt is collected in the mountains near Acheen, but the greateſt part is brought from the ſouthern ports of Nalaboo and Soofoo. The ſulphur is gathered from a volcano mountain in the neighbourhood, which ſupplies their own conſumption for the manufacture of gun-powder, and admits of a large exportation.

In their perſons, the Acheneſe differ from the reſt of the Sumatrans, being taller, ſtouter, and darker complexioned. They appear not to be a genuine people; but are thought, with great appearance of reaſon, to be a mixture of Battas, Malays, and Moors from the weſt of India. In their diſpoſitions they are more active and induſtrious than their neighbours; they poſſeſs more penetration and ſagacity; have more general knowledge; and as merchants, they deal upon a more extenſive and liberal footing. Their religion is Mahometaniſm; and, having a great number of moſques and prieſts, its forms and ceremonies are ſtrictly obſerved.

The appearance of the town, and the nature of the buildings, are much the ſame as are found in the generality of Malay bazars, excepting that the ſuperior wealth of this place has occaſioned a great number of public edifices, but without the ſmalleſt pretenſions to magnificence. The king's palace, if it deſerves the appellation, is a very rude and uncouth piece of architecture, deſigned to reſiſt the force of an enemy, and ſurrounded for that purpoſe by ſtrong walls, but without any regular plan, or view to the modern ſyſtem of military attack. The houſes in common are built of bamboos and rough timber, and raiſed ſome feet from the ground, on account of the place being overflowed in the rainy ſeaſon.

A conſiderable fabrick of a thick ſpecies of cotton cloth, and of ſtuff for the ſhort drawers worn both by Malays and Acheneſe, is eſtabliſhed here, and ſupplies an extenſive demand. They weave alſo very handſome ſilk pieces, of a particular form, for that part of the dreſs which is called by the Malays *cayen ſarrong.*

The Acheneſe are expert and bold navigators, and employ a variety of veſſels, according to the voyages they undertake, and the purpoſes for which they deſign them. The river is covered with a multitude of fiſhing ſampans or canoes, which go to ſea with the morning breeze, and return in the afternoon, with the ſea wind, full laden.

Having no convenient coins, though moſt ſpecies of money will be taken there at a valuation, they commonly make their payments in gold duſt, and for that purpoſe are all provided with ſcales or ſmall ſteelyards. They carry their gold about them, wrapped up in pieces of bladder, and often purchaſe to ſo ſmall an amount, as to make uſe of grain or ſeeds for weights.

The monarchy is hereditary; and the king uſually maintains a guard of 100 Seapoys about his palace.

According to Mr. Marſden, "the grand council of the nation conſiſts of, the King or *Sultan,* four *Oolooballangs,* and eight of a lower degree, who ſit on his right hand, and ſixteen *Cajoorangs,* who ſit on his left. At the king's feet ſits a woman, to whom he makes known his pleaſure: by her it is communicated to an eunuch, who ſits next to her, and by him to an officer named *Cajoorang Gondong,* who then proclaims it aloud to the aſſembly. There are alſo preſent two other officers, one of whom has the government of the *bazar* or market, and the other the ſuperintending and carrying into execution the puniſhment of criminals. All matters relative to commerce and the cuſtoms of the port, come under the juriſdiction of the *Shabandar,* who performs the ceremony of giving the *chap* or licence for trade; which is done by lifting a golden-handed creeſe over the head of the merchant who arrives, and without which he dares not to land his goods. Preſents, the value of which are become pretty regularly aſcertained, are then ſent to the king and his officers. If the ſtranger be in the ſtyle of an ambaſſador, the royal elephants are ſent down to carry him and his letters to the monarch's preſence; theſe being firſt delivered into the hands of an eunuch, who places them in a ſilver diſh, covered with rich ſilk, on the back of the largeſt elephant, which is provided with a machine *(houder)* for that purpoſe. Within about an hundred yards of an open hall where the king ſits, the cavalcade ſtops, and the ambaſſador diſmounts, and makes his obeiſance by bending his body, and lifting his joined hands to his head. When he enters the palace, if an European, he is obliged to take off his ſhoes; and having made a ſecond obeiſance, is ſeated upon a carpet on the floor, where *betel* is brought to him. The throne was ſome years ago of ivory and tortoiſeſhell, and when the place was governed by queens, a curtain of gauze was hung before it, which did not obſtruct the audience, but prevented any perfect view. The ſtranger, after ſome general diſcourſe, is then conducted to a ſeparate building, where he is entertained with the delicacies of the country, by the officers of ſtate, and in the evening returns in the manner he came, ſurrounded by a prodigious number of lights. On high days *(aree ryah)* the king goes in great ſtate mounted on an elephant richly capariſoned, to the great moſque, preceded by his *oolooballangs;* who are armed nearly in the European manner."

The country under the immediate juriſdiction of Acheen, is divided into three diſtricts, named *Duo* *pooloo duo, Duo pooloo leemo*, and *Duo pooloo anam*. Each diſtrict is governed by a Pangleemo, and under him an Imaum and four Pangeeches to each moſque.

"Achen has ever been remarkable for the ſeverity with which crimes are puniſhed by their laws; the ſame rigour ſtill ſubſiſts, and there is no commutation admitted, as is regularly eſtabliſhed in the ſouthern countries. There is great reaſon, however, to conclude, that the poor alone experience the rod of juſtice; the nobles being ſecure from retribution in the number of their dependents. Petty theft is puniſhed by ſuſpending the criminal from a tree, with a gun or heavy weight tied to his feet; or by cutting off a finger, a hand, or leg, according to the nature of the theft. Many of theſe mutilated and wretched objects are daily to be ſeen in the ſtreets. Robbery on the highway and houſe-breaking are puniſhed by drowning, and afterwards expoſing the body on a ſtake for a few days. If the robbery is committed upon an imaum or prieſt, the ſacrilege is expiated by burning the criminal alive. A man who is convicted of adultery is ſeldom attempted to be ſcreened by his friends, but is delivered up to the friends and relations of the injured huſband. Theſe take him to ſome large plain, and forming themſelves in a circle, place him in the middle. A large weapon called a *Gadoobong*, is then delivered to him by one of his family; and if he can force his way through thoſe who ſurround him, and make his eſcape, he is not liable to further proſecution; but it commonly happens that he is inſtantly cut to pieces. In this caſe his relations bury him as they would a dead buffalo, refuſing to admit the corpſe into their houſe, or to perform any funeral rites." Theſe diſcouragements to vice might ſeem to beſpeak a moral and virtuous people: yet all travellers agree in repreſenting the Acheneſe as one of the moſt diſhoneſt and flagitious nations of the Eaſt.

Achen was viſited by the Portugueſe in 1509, only 12 years after they had diſcovered the paſſage to the Eaſt-Indies by the Cape of Good Hope. They made various attempts to eſtabliſh themſelves in the country, but were expelled with diſgrace. See SUMMATRA.

ACHELOUS, in fabulous hiſtory, wreſtled with Hercules, for no leſs a prize than Deianira, daughter to king Oenus: but as Achelous had the power of aſſuming all ſhapes, the conteſt was long dubious: at laſt, as he took that of a bull, Hercules tore off one of his horns: ſo that he was forced to ſubmit, and to redeem it by giving the conqueror the horn of Amalthea, the ſame with the Cornucopia or horn of plenty; which Hercules having filled with a variety of fruits, conſecrated to Jupiter. Some explain this fable, by ſaying, That Achelous is a winding river of Greece, whoſe ſtream was ſo rapid that it roared like a bull, and overflowed its banks; but Hercules, by bringing it into two channels, broke off one of the horns, and ſo reſtoted plenty to the country. *See the next article.*

ACHELOUS, a river of Acarnania; which riſes in mount Pindus, and, dividing Ætolia from Acarnania, falls from north to ſouth into the Sinus Corinthiacus. It was formerly called *Thoas*, from its impetuoſity, and *king of rivers*, (Homer.) The epithet *Acheloius* is uſed for *Aqueus*, (Virgil); the ancients calling all water *Achelous*, eſpecially in oaths, vows, and ſacrifices, according to Ephorus: Now called *Aſpro Potamo*. Rivers are by the ancient poets called *Tauriformes*, either from the bellowing of their waters, or from their ploughing the earth in their courſe: Hercules, reſtraining by dykes and mounds the inundations of the *Achelous*, is ſaid to have broken off one of his horns, and to have brought back plenty to the country. *See the preceding article.*

ACHERI (LUKE D'), a learned Benedictine of the congregation of St Maur, was born at St Quintin, in Picardy, in 1609; and made himſelf famous by printing ſeveral works, which till then were only in manuſcript: particularly, The epiſtle attributed to St Barnabas; The works of Langfrank, archbiſhop of Canterbury; A collection of ſcarce and curious pieces, under the title of Spicilegium, *i. e.* Gleanings, in thirteen volumes, quarto. The prefaces and notes, which he annexed to many of theſe pieces, ſhow him to have been a man of genius and abilities. He had alſo ſome ſhare in the pieces inſerted in the firſt volumes of The acts of the ſaints of the order of St Bennet; the title whereof acquaints us that they were collected and publiſhed by him and father Mabillon. After a very retired life, till the age of 73, he died at Paris the 29th of April 1685, in the abbey of St. Germain in the fields, where he had been librarian.

ACHERNER, or ACHARNER, a ſtar of the firſt magnitude in the ſouthern extremity of the conſtellation ERIDANUS.

ACHERON, a river of Epirus. The poets feigned it to have been the ſon of Ceres, whom ſhe hid in hell for fear of the Titans, and turned into a river, over which ſouls departed were ferried on their way to Elyſium.

ACHERON, a river of Theſprotia, in Epirus; which, after forming the lake Acheruſia, at no great diſtance from it, falls into the ſea near the promontory of Chimerium, to the weſt of the Sinus Ambracius, in a courſe from north to ſouth.

ACHERON or ACHEROS, a river of the Bruttii in Italy, running from eaſt to weſt; where Alexander king of Epirus was ſlain by the Lucani, being deceived by the oracle of Dodona, which bid him beware of Acheron.

ACHERSET, an ancient meaſure of corn, conjectured to be the ſame as our quarter, or eight buſhels.

ACHERUSIA PELUS, a lake between Cumæ and the promontory Miſenum, now *il Lago Della Collucia*, (Cluverius.) Some confound it with the *Lacus Lucrinus*, and others with the *Lacus Averni*. But Strabo and Pliny diſtinguiſh them. The former takes it to be an effuſion, exundation, or waſhes of the ſea, and therefore called by Lycophron, Αχηρȣσια χυσις.—Alſo a lake of Epirus, through which the Acheron runs.—There it alſo an *Acheruſia*, a peninſula of Bithynia on the Euxine, near Heraclea; and a cave there of the ſame name, through which Hercules is fabled to have deſcended to hell to drag forth Cerberus.

ACHIAR, is a Malayan word, which ſignifies all ſorts of fruits and roots pickled with vinegar and ſpice. The Dutch import from Batavia all ſorts of achiar, but particularly that of BAMBOO (ſee ARUNDO), a kind of cane, extremely thick, which grows in the Eaſt Indies. It is preſerved there, whilſt it is ſtill green, with very ſtrong vinegar and ſpice; and is called *bamboo-achiar*. The name changes according to the fruit with which the achiar is made.

ACHICOLUM, is uſed to expreſs the *fornix tholus*

Achillæa.

Achillæa.

lus, or *ſudatorium* of the ancient baths; which was a hot room where they uſed to ſweat. It is alſo called *architholus*.

ACHILLÆA, Yarrow, Milfoil, Nosebleed, or Sneezewort; a genus of the order of the polygamia ſuperflua, belonging to the ſyngeneſia claſs of plants. The natural order to which it belongs is the 49th, *Compoſitæ diſcoides*.

The characters are: The common *calyx* is ovate and imbricated, with ovate, acute, converging ſcales. The *compound corolla* is rayed; the hermaphrodite corollets are tubular in the diſc, the feminine linguiform and from 5 to 10 in the rays: The *proper corolla* of the hermaphrodites is funnel-ſhaped, expanded, and divided into 5 ſegments; that of the females, tongue-ſhaped, inverſely cordated, expanding, and of 3 ſegments. The *ſtamina* in the hermaphrodites conſiſt of 5 very ſhort capillary filaments; the anthera is cylindric and tubular. The *piſtillum* in the hermaphrodites has a ſmall germen; the ſtylus is filiform the length of the ſtamina; the ſtigma is obtuſe and endnotched: in the females, the germen is ſmall; the ſtylus is filiform; the ſtigmata are 2, obtuſe and reflected. The *pericarpium* is wanting; the calyx ſcarcely changed; the receptacle filiform, elongated at the diſc of the ſeeds, ovate, and twice as long as the calyx. The *ſeeds* are ſolitary, ovate, and furniſhed with a lock of wool; no pappus. The *receptaculum* is chaffy and elevated.

Species and properties. There are 20 ſpecies, of which the following are the principal: 1. The millefolium, or common yarrow, is found naturally on banks, and by the ſides of foot paths, in moſt parts of England. It moſt commonly bears white flowers, though a variety of it is found which bears purple ones. Theſe, however, do not long continue to bear flowers of this colour if tranſplanted into gardens. It was formerly uſed in medicine; but though it may ſtill have a place in ſome diſpenſatories, no phyſician of any note expects any virtue from it, or ever preſcribes it. It creeps greatly by its roots, and alſo multiplies by the ſeeds, ſo that it becomes a troubleſome weed where it is once allowed to get a footing. The cultivation of it is recommended by Mr Anderſon, in his Eſſays on Agriculture, as a proper food for cattle. This ſpecies was the proper achillæa of the ancients, ſo named from Achilles; who, having been the diſciple of Chiron, firſt brought it into uſe for the cure of wounds and ulcers. 2. The ſantolina, or eaſtern ſneezewort, is ſometimes cultivated in gardens; it has large yellow flowers, which ſtand upon pretty long footſtalks placed ſingly, not in bunches as in the common kind. It has leaves like lavender-cotton, which, when rubbed, emit a ſtrong oily odour. The flowers appear in June and July. 3. The tomentoſa, or wooly yarrow, is a native of the ſouth of France and Spain, but lives in the open air in England. The flowers are of a bright yellow, and continue long in beauty, growing in cluſters at the top of the ſtalks, which ſeldom riſe above a foot high. The leaves are finely cut, and very hoary. 4. The abrotanifolia, or tall eaſtern yarrow, is a native of the iſlands in the Archipelago; it grows to the height of two feet and a half, with large umbels of yellow flowers on the top; the leaves reſemble thoſe of the common wormwood, and are cut into long narrow ſegments. 5. The clavenna, or Alpine umbelliferous wormwood, takes its name from the mountains of which it is a native. It ſeldom grows above ſix or ſeven inches in height; it ſupports umbels of white flowers, like thoſe of the common ſneezewort, which appear in April and May. The leaves are ſilvery, and ſhaped like thoſe of wormwood, which often decay in the autumn and winter. 6. The tanacetifolia, or eaſtern ſneezewort, with tanſey leaves, is a very humble plant, ſeldom riſing above ſix inches in height. The flowers are nearly as large as thoſe of the common ſneezewort, white, and growing in flat umbels. They appear in June and July. The leaves of the plant have ſome likeneſs to thoſe of the common wormwood, are very hoary, grow cloſe to the ground, and decay in autumn ſo as to make little appearance in winter. Like the laſt ſpecies, this is a native of the Alps. 7. The ageratum, or ſweet maudlin, was formerly much uſed in medicine and for culinary purpoſes, but has now fallen ſo much into neglect as to be totally unknown in the markets; ſo that when it is demanded, the white maudlin is ſubſtituted in its ſtead. The reaſon of this ſubſtitution was, that the latter is more hardy and eaſily propagated than the ſweet maudlin, which is apt to rot in wet winters. The common maudlin flowers in June and July, and the ſeeds are ripe in September. 8. The Egyptiaca, or hoary ſneezewort, is a native of the Archipelago. It hath very hoary leaves, which remain all the year; and the plants growing cloſe and low, make a pretty appearance at all ſeaſons. The flowers are yellow, and are produced in umbels on the top of the ſtalks; they appear in June, and continue till the end of September. 9. The ptarmica, or common ſneezewort, grows wild in the woods, and other ſhady places, in many parts of England: ſo is not admitted into gardens. There is a variety, however, with double flowers, which is preſerved in gardens, and is commonly known by the name of *double maudlin*. This ſpecies creeps greatly by the roots, ſo as ſoon to overſpread a large ſpot of ground. If planted in pots, ſo as to confine its roots from creeping, the ſtalks grow cloſe together, and make a tolerable appearance when in flower; but when at a diſtance, ſo that the roots have full liberty to run, the flowers appear but indifferently. 10. The macrophylla, or Alpine ſneezewort, with fewer leaves, is a native of the Alps. It produces many ſtalks riſing near three feet high; having looſe branching umbels of white flowers on their top, reſembling thoſe of the common ſneezewort, but larger. 11. The nana, or hoary Alpine milfoil, is likewiſe a native of the Alps; the leaves are hoary, and the umbels of its flowers are more compact than the former; the ſtalks do not riſe more than a foot high. 12. The nobilis, or ſweet milfoil, approaches to the nature of the common milfoil; but its leaves are of a paler green, and are neither ſo long nor ſo much cut off as thoſe of the common milfoil are: they have a ſtrong ſweet ſcent when bruiſed. 13. The alpina, or white maudlin, bears ſome reſemblance to the common ſneezewort; but the leaves are longer, of a deeper green colour, and deeply indented in their edges; the flowers are white, and the roots creep far under ground. The plant will riſe, in good land, to the height of four feet.

Culture. All the ſorts of yarrow are eaſily propagated by ſeeds, which may be ſown either in the ſpring or autumn, upon a bed of common earth. When the plants come up, and are ſtrong enough for tranſplanting, they ſhould be planted in beds in the nurſery, where they may continue till autumn, when they ſhould be tranſplanted to the places where they are to remain. The Archipelago kinds, however, are often deſtroyed by ſevere froſt; ſo they ought to be ſheltered during the winter. Theſe kinds alſo rarely bring their ſeeds to perfection in England; they are therefore to be propagated by ſlips, which may be taken off and planted in a ſhady border any time in ſummer, when they will take root in about ſix weeks, and then may be tranſplanted where they are to remain.

ACHILLEID, ACHILLEIS, a celebrated poem of Statius, in which that author propoſed to deliver the whole life and exploits of Achilles; but being prevented by death, he has only treated of the infancy and education of this hero. See STATIUS.

ACHILLES, one of the greateſt heroes of ancient Greece, was the ſon of Peleus and Thetis. He was a native of Pythia, in Theſſaly. His mother, it is ſaid, in order to conſume every mortal part of his body, uſed to lay him every night under live coals, anointing him with ambroſia, which preſerved every part from burning but one of his lips, owing to his having licked it. She dipped him alſo in the waters of the river Styx; by which his whole body became invulnerable, except that part of his heel by which ſhe held him. But this opinion is not univerſal, nor is it a part of his character as drawn by Homer; for in the Iliad (B. xxi. 161.) he is actually wounded in the right arm, by the lance of Aſteropaus, in the battle near the river Scamander. Thetis afterwards intruſted him to the care of the centaur Chiron, who, to give him the ſtrength neceſſary for martial toil, fed him with honey and the marrow of lions and wild boars. To prevent his going to the ſiege of Troy, ſhe diſguiſed him in female apparel, and hid him among the maidens at the court of king Lycomedes: but Ulyſſes diſcovering him, perſuaded him to follow the Greeks. Achilles diſtinguiſhed himſelf by a number of heroick actions at the ſiege. Being diſguſted, however, with Agamemnon for the loſs of Briſeis, he retired from the camp. But returning to avenge the death of his friend Patroclus, he ſlew Hector, faſtened his corps to his chariot, and dragged it round the walls of Troy. At laſt Paris, the brother of Hector, wounded him in the heel with an arrow, while he was in the temple treating about his marriage with Philoxena, daughter to king Priam. Of this wound he died, and was interred on the promontory of Sigæum; and after Troy was taken, the Greeks ſacrificed Philoxena on his tomb, in obedience to his deſire, that he might enjoy her company in the Elyſian fields. It is ſaid, that Alexander, ſeeing this tomb, honoured it by placing a crown upon it; at the ſame time crying out, that "Achilles was happy in having, during his life, ſuch a friend as Patroclus; and, after his death, a poet like Homer." Achilles is ſuppoſed to have died 1183 years before the Chriſtian æra.

ACHILLES TATIUS. See TATIUS.

Tendo ACHILLIS, in anatomy, is a ſtrong tendinous cord formed by the tendons of ſeveral muſcles, and inſerted into the os calcis. It has its name from the fatal wound Achilles is ſaid to have received in that part from Paris the ſon of Priam.

ACHILLINI (Alexander), born at Bologna, and doctor of philoſophy in that univerſity. He flouriſhed in the 15th and 16th centuries, and by way of eminence was ſtyled the Great Philoſopher. He was a ſtedfaſt follower and accurate interpreter of Averroes upon Ariſtotle, but moſt admired for his acuteneſs and ſtrength of arguing in public and private diſputations. He made a ſurpriſing quick progreſs in his ſtudies, and was very early promoted to a profeſſorſhip in the univerſity; in which he acquitted himſelf with ſo much applauſe that his name became famous throughout all Italy. He continued at Bologna till the year 1506; when the univerſity of Padua made choice of him to ſucceed Antonio Francatiano in the firſt chair of philoſophy, and his fame brought vaſt numbers of ſtudents to his lectures at Padua; but the war, wherein the republic of Venice was engaged againſt the league of Cambray, putting a ſtop to the lectures of that univerſity, he withdrew to his native country; where he was received with the ſame marks of honour and diſtinction as before, and again appointed profeſſor of philoſophy in Bologna. He ſpent the remainder of his life in this city, where he died, and was interred with great pomp in the church of St Martin the Great, which belongs to the Carmelite friars. Jovius, who knew Achillini, and heard his lectures, ſays, that he was a man of ſuch exceeding ſimplicity, and ſo unacquainted with addreſs and flattery, that he was a laughing ſtock to the pert and ſaucy young ſcholars, although eſteemed on account of his learning. He wrote ſeveral pieces on philoſophical ſubjects, which he publiſhed, and dedicated to John Bentivogli.

ACHILLINI (Claudius), grandſon of the former, read lectures at Bologna, Ferrara, and Parma; where he was reputed a great philoſopher, a learned divine, an excellent lawyer, an eloquent orator, a good mathematician, and an elegant poet. He accompanied Cardinal Ludovino, who went as legate into Piedmont; but being afterward neglected by this cardinal, when he became pope under the name of Gregory XV. he left Rome in diſguſt, and retired to Parma; where the duke appointed him profeſſor of law, with a good ſalary. He publiſhed a volume of Latin Letters, and another of Italian poems, which gained him great reputation: he died in 1640, aged 66.

ACHIOTTE, or ACHIOTL, a foreign drug, uſed in dying, and in the preparation of chocolate. It is the ſame with the ſubſtance more uſually known by the name of ARNOTTO; which ſee.

ACHIROPOETOS, a name given by ancient writers to certain miraculous pictures of Chriſt and the Virgin, ſuppoſed to have been made without hands.—The moſt celebrated of theſe is the picture of Chriſt, preſerved in the church of St John Lateran at Rome; ſaid to have been begun by St Luke, but finiſhed by the miniſtry of angels.

ACHMET, ſon of Seerim, has left a book concerning the interpretation of dreams according to the doctrine of the Indians, Perſians, and Egyptians, which was tranſlated out of Greek into Latin by Leo Tuſcus in 1160. He lived in the 9th century.

ACHMET GEDUC, a famous general under Mahomet II. and Bajazet II. in the 15th century. When Mahomet II. died, Bajazet and Zezan both claimed the throne: Achmet ſided with the former, and by his bravery and conduct fixed the crown on his head. But Bajazet took away his life; ſhining virtue being always an unpardonable crime in the eyes of a tyrant.

ACHMETSCHET, a town of the peninſula of the Crimea, the reſidence of the ſultan Galga, who is eldeſt ſon of the Khan of Tartary. Long. 51. 20. Lat. 45. 0.

ACHMIM, a large town of Upper Egypt, ſituated on the eaſtern bank of the Nile. "One admires there (ſays Abulfeda, as quoted by Mr Savary) a temple, which is comparable to the moſt celebrated monuments of antiquity. It is conſtructed with ſtones of a ſurpriſing ſize, on which are ſculptured innumerable figures." Though this town be fallen from its ancient ſplendor, it is ſtill one of the moſt beautiful of Upper Egypt. According to Mr Savary, an Arab prince commands there, and the police is well attended to. The ſtreets are wide and clean, and commerce and agriculture flouriſh. It has a manufactory of cotton, ſtuffs, and pottery, which are conveyed over all Egypt. It is the ſame that Herodotus calls *Chemmis*, and Strabo *Panopolis*, or the city of Pan, who was worſhipped there. Herodotus ſays, that Perſeus was a native of this city, and that his deſcendents had eſtabliſhed feſtivals there in his honour. It has loſt its ancient edifices, and much of its extent; the ruins of the temple, deſcribed by Abulfeda, being without its limits, to the north. Nothing remains of it but ſome ſtones, of ſuch magnitude that the Turks have not been able to move them. They are covered with hieroglyphics. On one of them are traced four concentric circles, in a ſquare. The innermoſt of theſe contains a ſun. The two ſucceeding ones, divided into 12 parts, contain, one, 12 birds, the other, 12 animals almoſt effaced, which appear to be the ſigns of the zodiac. The fourth has no diviſions, and preſents 12 human figures; which Mr Savary imagines to repreſent the 12 gods, the 12 months of the year, and the 12 ſigns of the zodiac. The Egyptians, ſays Herodotus, are the firſt who divided the year into 12 months, and employed the names of the 12 gods. The four ſeaſons occupy the angles of the ſquare, on the ſide of which may be diſtinguiſhed a globe with wings. Mr Savary thinks it probable that this ſtone belonged to a temple dedicated to the ſun, that the whole of theſe hieroglyphics mark his paſſage into the ſigns of the zodiac, and his courſe, whoſe revolution forms the year. The columns of this temple have been partly broken to make lime and millſtones. Some of them have been tranſported into one of the moſques of Achmim, where they are placed without taſte; others are heaped up in the ſquares of the town.

Mr Savary tells us of a ſerpent which is worſhipped here, and is the wonder of the country. "Upwards of a century ago, (ſays he), a religious Turk called *Scheilk Haridi* died here. He paſſed for a ſaint among the Mahometans; who raiſed a monument to him, covered with a cupola, at the foot of the mountain. The people flocked from all parts to offer up their prayers to him. One of their prieſts, profiting by their credulity, perſuaded them that God had made the ſoul of Scheilk Haridi paſs into the body of a ſerpent. Many of theſe are found in the Thebais, which are harmleſs; and he had taught one to obey his voice. He appeared with his ſerpent, dazzled the vulgar by his ſurpriſing tricks, and pretended to cure all diſorders. Some lucky inſtances of ſucceſs, due to nature alone, and ſometimes to the imagination of the patients, gave him great celebrity. He ſoon confined his ſerpent Haridi to the tomb, producing him only to oblige princes and perſons capable of giving him a handſome recompence. The ſucceſſors of this prieſt, brought up in the ſame principles, found no difficulty in giving ſanction to ſo advantageous an error. They added to the general perſuaſion of his virtue that of his immortality. They had the boldneſs even to make a public proof of it. The ſerpent was cut in pieces in preſence of the Emir, and placed for two hours under a vaſe. At the inſtant of lifting up the vaſe, the prieſts, no doubt, had the addreſs to ſubſtitute one exactly reſembling it. A miracle was proclaimed, and the immortal Haridi acquired a freſh degree of conſideration. This knavery procures them great advantages. The people flock from all quarters to pray at this tomb; and if the ſerpent crawls out from under the ſtone, and approaches the ſuppliant, it is a ſign that his malady will be cured. It may be imagined, that he does not appear till an offering has been made proportioned to the quality and riches of the different perſons. In extraordinary caſes, where the ſick perſon cannot be cured without the preſence of the ſerpent, a *pure virgin* muſt come to ſolicit him. To avoid inconveniences on this head, they take care to chooſe a *very young girl indeed*. She is decked out in her beſt clothes and crowned with flowers. She puts herſelf in a praying attitude; and as the prieſts are inclined, the ſerpent comes out, makes circles round the young ſuppliant, and goes and repoſes on her. The virgin, accompanied by a vaſt multitude, carries him in triumph amidſt the general acclamation. No human reaſoning would perſuade theſe ignorant and credulous Egyptians that they are the dupes of a few impoſtors: they believe in the ſerpent Haridi as firmly as in the prophet."

ACHONRY, a ſmall town of Ireland, in the province of Connaught and county of Sligo, ſeated on the river Shannon.

ACHOR, a valley of Jericho, lying along the river Jordan, not far from Gilgal; ſo called from Achan, the troubler of Iſrael, being there ſtoned to death.

Achor, in medicine, a ſpecies of Herpes.

Achor, in mythology, the god of flies; to whom, according to Pliny, the inhabitants of Cyrene ſacrificed, in order to obtain deliverance from the inſects and the diſorders occaſioned by them.

ACHRADINA, (anc. geog.), one of the four cities or diviſions of Syracuſe, and the ſtrongeſt, largeſt, and moſt beautiful part of it; ſeparated by a very ſtrong wall from the outer town, *Tycha* and *Neapolis*. It was adorned with a very large forum, with beautiful porticos, a moſt elegant prytaneum, a ſpacious ſenate-houſe, and a ſuperb temple of Jupiter Olympius.

ACHRAS, or Sapota Plum: a genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the 43d Natural Order, *Dumoſæ*.

The characters are: The *calyx* is a perianthium, conſiſting of ſix ovate concave erect leaflets, the exterior ones broader and ſhorter, the interior ones coloured. The *corolla* is compoſed of one ovate petal, the height of the calyx; the border divided into ſix ſegments. The *ſtamina* have ſix ſhort ſubulated filaments at the throat of the corolla; and the antheræ are acute. The *piſtillum* has a roundiſh depreſſed germen; the ſtylus is ſubulated, and longer than the corolla; the ſtigma is obtuſe. The *pericarpium* is a globular twelve-celled pomum, with very ſoft fleſh. The ſeeds are ſolitary, ovate, and gloſſy.

There are four ſpecies, all natives of the Weſt Indies. The principal are, 1. The ſapota, with oblong oval leaves, and ſmooth turbinated fruit. 2. The mammoſa, with ſpear-ſhaped leaves, and large oval fruit. The firſt is common about Panama, and ſome places in the Spaniſh Weſt Indies; but is not to be found in any of the Britiſh ſettlements in America. The ſecond ſort is very common in Jamaica, Barbadoes, and moſt of the Weſt India iſlands, where the trees are planted in the gardens for their fruit, which is by many perſons greatly eſteemed. They grow to the height of 35 or 40 feet, having a ſtraight trunk covered with an aſh-coloured bark. The branches are produced on every ſide, forming a regular head; and are beſet with leaves near a foot long, and almoſt three inches broad in the middle. The flowers are of a cream colour: and are ſucceeded by large oval fruit covered by a browniſh ſkin, incloſing a thick pulp of a ruſſet colour, very luſcious, and called *natural marmalade*, from its reſemblance to that of quinces. The ſtones taken in emulſion are reckoned good againſt the gravel.—Theſe trees being natives of very hot climates, cannot be preſerved in Britain, except in the warmeſt ſtoves.

ACHROMATIC, an epithet expreſſing want of colour. The word is Greek, being compounded of α, privative, and χρωμα, *colour*.

ACHROMATIC Teleſcopes, are teleſcopes contrived to remedy the aberrations in colours; ſee ABERRATION.—A particular account of the invention and conſtruction of theſe inſtruments will be found under OPTICS.

ACHTELING, a meaſure for liquids uſed in Germany. Thirty-two *achtelings* make a *heemer*; four *ſciltims* or *ſciltins*, make an *achteling*.

ACHYR, a ſtrong town and caſtle of the Ukrain, ſubject to the Ruſſians ſince 1667. It ſtands on the river Uorſklo near the frontiers of Ruſſia, 127 miles W. of Kiow, Long. 36. 0. Lat. 49. 32.

ACHYRANTHES, in botany, a genus of the pentandria order, belonging to the monogynia claſs of plants, and aſſociating with the *Miſcellaneæ*, in the 54th Natural Order.

The characters are: The *calyx* is a double perianthium; the exterior one conſiſting of three lanced acute leaves, which are perſiſtent; the interior of five leaves, alſo perſiſtent. No *corolla*: The nectarium is five-valved, ſurrounding the germen, bearded at the top, concave, and falling off. The *ſtamina* conſiſt of five filaments the length of the corolla, the antheræ are ovate and incumbent. The *piſtillum* has a top-ſhaped germen; the ſtylus is filiform, and the length of the ſtamina; the ſtigma is villous, and divided into two ſegments. The *perianthium* is a roundiſh one-celled capſule, not gaping. The *ſeed* is ſingle and oblong.

Of this genus eight ſpecies are enumerated; but the character of the genus does not agree in them all.

The ſpecies are all natives of the Indies. Only one of them, the amaranthus, is commonly cultivated in botanical gardens, and that more for the ſake of variety than beauty. It grows to the height of three feet, with oblong pointed leaves. The flowers come out in long ſpikes from the extremities of the branches, and appear in July, the ſeeds ripening in September. Plants of this kind muſt be reared in a hot-bed, and may be tranſplanted when they have acquired ſufficient ſtrength. If kept in pots, and ſheltered during the winter in a warm green-houſe, they will live two or three years.

ACICANTHERA, in botany, the trivial name of a ſpecies of RHEXIA.

ACICULÆ, the ſmall pikes or prickles of the hedge-hog, echinus-marinus, &c.

ACIDALIUS (Valens) would, in all probability, have been one of the greateſt critics in theſe latter ages, had he lived longer to perfect thoſe talents which nature had given him. He was born at Witſtock, in Brandenburg; and having viſited ſeveral academies in Germany, Italy, and other countries, where he was greatly eſteemed, he afterwards took up his reſidence at Breſlaw, the metropolis of Sileſia. Here he remained a conſiderable time, in expectation of ſome employment; but nothing offering, he turned Roman-catholic, and was choſen rector of a ſchool at Nieſſa. It is related, that about four months after, as he was following a proceſſion of the hoſt, he was ſeized with a ſudden phrenzy; and being carried home, expired in a very ſhort time. But Thuanus tells us, that his exceſſive application to ſtudy was the occaſion of his untimely death; and that his ſitting up a-nights in compoſing his Conjectures on Plautus, brought upon him a diſtemper which carried him off in three days, on the 25th of May 1595, being juſt turned of 28. He wrote a Commentary on Quintus Curtius; alſo, Notes on Tacitus, on the Twelve Panegyrics; beſides ſpeeches, letters, and poems. His poetical pieces are inſerted in the *Deliciæ* of the German poets, and conſiſt of epic verſes, odes, and epigrams. A little piece, printed in 1595, under the title of *Mulierus non eſſe hominus*, "That women were not of the human ſpecies," was falſely aſcribed to him. But the fact was, that Acidalius happening to meet with the manuſcript, and thinking it very whimſical, tranſcribed it, and gave it to the bookſeller, who printed it. The performance was highly exclaimed againſt, inſomuch that the bookſeller being ſeized, he diſcovered the perſon who gave him the manuſcript, and a terrible outcry was made againſt Acidalius. A ſtory goes, that being one day to dine at a friend's houſe, there happened to be ſeveral ladies at table: who ſuppoſing him to be the author, were moved with ſo much indignation, that they threatened to throw their plates at his head. Acidalius, however, ingeniouſly diverted their wrath. In his opinion, he ſaid, the author was a judicious perſon, the ladies being certainly more of the ſpecies of *angels* than of *men*.—Mr Baillet has given him a place among his *Enfans Celebres*: and ſays, that he wrote a comment upon Plautus when he was but 17 or 18 years old, and that he compoſed ſeveral Latin poems at the ſame age.

ACIDALUS, a fountain in Orchomenus, a city of Bœotia, in which the Graces, who are ſacred to Venus, bathed. Hence the epithet *Acidalia*, given to Venus, (Virgil.)

ACIDITY, that quality which renders bodies acid.

ACIDOTON, in botany, the trivial name of a ſpecies of ADELIA.

1 General properties of acids.

ACIDS, in chemiſtry, the name by which one of the general claſſes of ſalts are diſtinguiſhed. The characteriſtic marks of them are, 1. The peculiar taſte which we call ſour; though this does not hold univerſally: for the acid of arſenic, which in other reſpects manifeſts a ſtrong acid power, has not this ſour taſte; nor are the volatile ſulphureous acid, or thoſe of *tungſten* and *molybdæna*, lately diſcovered by Mr Scheele, very diſtinguiſhable in this way. On the other hand, the ſtrong acids of vitriol, nitre, and even ſea-ſalt, are altogether cauſtic, and cannot be taſted until they have been largely diluted with water. 2. With water they combine into a fluid, the ſpecific gravity of which is not a medium betwixt the water and acid ſeparately taken. This holds good with the ſtrong acids, which grow hot with water, and ſhrink into leſs bulk by reaſon of their emitting a quantity of the fire they contain: but whether it alſo takes place in the weaker acids, has not yet been aſcertained; though the probability is, that it will take place in them alſo. 3. With ſpirit of wine, they unite into a very volatile and inflammable ſubſtance called *ether*. This alſo muſt be underſtood only of the ſtrong mineral acids, or of the acetous when very much concentrated; for the acids of tartar, borax, arſenic, lapis ponderoſus (*tungſten*), and molybdæna, do not produce any. 4. They change the blue colour of vegetables to red, and heighten the colour of thoſe which are already red.—This property is more univerſal than thoſe we have yet mentioned; but the volatile ſulphureous acid, thoſe of tungſten and molybdæna, are exceptions. 5. They unite with all kinds of earths excepting the ſiliceous (though the fluor acid diſſolves this alſo), with fixed and volatile alkalies, and with metals, in ſuch a manner as to form compounds conſiderably permanent, and whoſe ingredients cannot be ſeparated without ſome difficulty. This is the moſt univerſal and diſtinguiſhing mark; and there is not any acid but what ſhows its attraction for one or other of theſe ſubſtances, eſpecially the alkaline ſalts. Oils and fats, indeed, will unite with alkalies; but they may be ſeparated by the weakeſt known acids, ſo that there is no danger of confounding the two together. 6. When mixed with any fermentable liquor, they prevent that proceſs from taking place; or, if it has already begun, they will put a ſtop to it. This muſt alſo be underſtood only of the ſtronger acids, or at leaſt will require a conſiderable quantity of the weaker to effect it. 7. They cannot be frozen but in a degree of cold below the freezing point of water. This property is likewiſe not univerſal, but is remarkable only in the ſtronger acid.

2 Of the nature of acids.

The nature of acids has long been a matter of ſpeculation, and of late has engaged the attention of philoſophers very conſiderably. Some have ſuppoſed them to be ſimple chemical elements, while others imagined them to be compoſed of water and earth. Both theſe opinions, however, are inadmiſſible; the former, becauſe we are certain that moſt acids may be entirely decompoſed, and reſolved into aerial vapours of different kinds, which could not happen if they were ſimple and unchangeable elements; the latter, becauſe there is not the ſmalleſt probability that two ingredients, ſeemingly ſo inſipid and inactive as water and earth, could by their union produce a compound endowed with ſuch powerful and even deſtructive properties as many of the acids poſſeſs.——The late diſcoveries concerning air of different kinds have ſuggeſted a new theory, firſt publiſhed by M. Lavoiſier, and ſtrenuouſly maintained by the French chemiſts, *viz.* That the acid principle is contained in the air; and, according as it combines itſelf with different ſubſtances, forms acids of different denominations.

3 Mr Lavoiſier's hypotheſis, that air is the acid principle.

This theory he conſiders as eſtabliſhed by numerous indiſputable experiments. Theſe cannot here be detailed; but his concluſions from the whole are, That "*dephlogiſticated air* enters as a conſtituent part into the compoſition of ſeveral acids, particularly the phoſphoric, vitriolic, and nitrous; that this pure and highly reſpirable air is the conſtitutive principle of acidity common to all acids; and that the difference by which they are diſtinguiſhed from each other is produced by the union of one or more principles beſides this air, ſo as to conſtitute the particular form under which each acid appears." To dephlogiſticated air in its ſtate of fixity, therefore, he gives the title of the *acidifying* or *oxygenous* principle; and concludes farther from his experiments, 1. "That, when combined with the matter of fire, heat, and light, this principle produces dephlogiſticated air; though he conſiders this poſition as not capable of abſolute demonſtration. It muſt not, therefore, be confounded with the following; which, he ſays, are ſupported by experiment and poſitive proofs. 2. That the ſame acidifying principle, combined with phlogiſtic ſubſtances or charcoal, forms fixed air. 3. That with ſulphur it forms vitriolic acid. 4. That with nitrous air it forms nitrous acid. 5. That with Kunckel's phoſphorus, it forms the phoſphoric acid. 6. With ſugar it forms the acid of ſugar," &c.

4 Baſis of dephlogiſticated air ſuppoſed to be the acid principle.

5 Mr Kirwan's opinions.

The opinion of Mr Lavoiſier concerning the compoſition of acids has in part been adopted by Mr Kirwan; who, in his treatiſe on Phlogiſton, publiſhed in 1787, informs us, that he is now of opinion "that dephlogiſticated air becomes an eſſential conſtituent part of acids. All acids (he adds) conſiſt of two principles: one peculiar to each, which, in the opinion of the antiphlogiſtians, has not as yet been decompoſed, and conſequently muſt be looked upon, relatively to the preſent ſtate of our knowledge, as a ſimple ſubſtance: the other, *pure air*, in a concrete ſtate; that is, deprived of the greater part of its ſpecific heat, and condenſed into a ſmall volume. The firſt they call the *acid baſis*; the laſt, the *oxygenous* principle: thus the vitriolic acid, according to them, conſiſts of ſulphur as its baſis, and pure air in a concrete ſtate as its acidifying or oxygenous principle. This doctrine of the compoſition of acids has been admitted by ſome of the ableſt defenders of phlogiſton, and particularly by that diſtinguiſhed philoſophic chemiſt M. de Morveau, with this ſingle modification, that the baſes of acids contain phlogiſton, which they loſe on uniting to pure air: yet it ſeems very difficult to conceive how pure air can unite to phlogiſton, a ſubſtance to which it has the greateſt affinity, without forming a new compound endowed with very different properties from thoſe which it poſſeſſed before ſuch union. It ſeems therefore more reaſonable to conclude, either that it forms water, as Mr Cavendiſh thinks; or fixed air, as I ſhall afterwards endeavour to prove."

In his explanation of the formation of acids, Mr

Kirwan firſt ſtates the opinion of the antiphlogiſtians, viz. That the vitriolic acid, when conſidered abſtractedly from the water it contains, always conſiſts of ſulphur (which they conſider as a ſimple ſubſtance) united to a large portion of the oxygenous principle. "In my opinion (ſays he), it conſiſts of a baſis or radical principle, which, when ſaturated with phlogiſton, conſtitutes ſulphur; when ſaturated with fixed air, becomes common fixed vitriolic acid; and, when combined partly with the one and partly with the other, becomes volatile vitriolic acid. That ſulphur, during its converſion into vitriolic acid, unites to air of ſome ſort or other, is evident from the quantity of air which it abſorbs, in whatever way that converſion is brought about. Thus, firſt, during combuſtion in reſpirable air, 100 grains of ſulphur abſorb 420 cubic inches of pure air, or about 143 grains: but the proportion of this pure air united with a given quantity of ſulphur is not eaſily determined, becauſe it is vitriolic air that is conſtantly formed; and this air eſſentially contains ſome portion of ſulphur in ſolution, which portion is variable. Secondly, Pyrites, during their decompoſition, abſorb a conſiderable proportion of pure air, as Mr Lavoiſier has obſerved; ſo alſo does liver of ſulphur expoſed to the atmoſphere, for after ſome time it is converted into tartar vitriolate."

6
Whether pure air abſorbed in the burning of ſulphur continues to be ſo.

Mr Kirwan next proceeds to inquire, whether the air abſorbed during the combuſtion of ſulphur continues to be pure air; or whether it be converted into water or fixed air? He inclines to the latter opinions, for various reaſons* which he ſpecifies.

7
Formation of the nitrous acid.

With regard to the nitrous acid, the experiments of Mr Cavendiſh, as well as of the French chemiſts, leave no room to doubt that it is produced during the deflagration of dephlogiſticated and inflammable air. Mr Cavendiſh has ſhown that the nitrous acid may be formed by taking the electric ſpark in a mixture of three meaſures of phlogiſticated air and ſeven of dephlogiſticated air, or, in weight, one part of the former and about 2.6 of the latter. Mr Lavoiſier, as has been already mentioned, ſuppoſes the nitrous acid to be compoſed of nitrous air united to the oxygenous principle, or baſis of pure air; and 100 grains of dry nitrous acid conſiſt of 64 grains of nitrous air united to 36 of pure air deprived of its ſpecific fire; or, according to Mr Kirwan's calculation, 173 cubic inches of nitrous air and 105 of pure air. But nitrous air, as Mr Lavoiſier himſelf has obſerved, is a compound; 100 grains of it, according to him, containing 32 of phlogiſticated and 68 of pure air; conſequently 64 grains of it contain 20.5 of phlogiſticated air, and 43.5 of pure air. Hence, according to him, 100 grains of dry nitrous acid contain 79½ of pure air and 20½ of phlogiſticated air. Mr Kirwan is of opinion that 100 grains of pure, dry, and colourleſs nitrous acid contain 38.17 grains of fixed air as its acidifying principle, 57.06 of nitrous baſis, and 4.77 of phlogiſton united to the nitrous baſis. With regard to the nitrous baſis itſelf, he ſays that one third of its weight is phlogiſticated and two thirds dephlogiſticated air, both in a concrete ſtate.

8
Proportion of its conſtituent parts.

"Nitrous baſis (ſays Mr Kirwan), ſaturated with phlogiſton, conſtitutes nitrous air; 100 grains of this baſis take up nearly 22 of phlogiſton. Hence the conſtituent principles of nitrous acid are fixed air, dephlogiſticated air, phlogiſticated air, and inflammable air, all in their concrete ſtate.

"Red, yellow, green, and blue nitrous acids, when thoſe colours are intenſe, owe their origin to the abſorption of nitrous air, and conſequently the proportion of their principles is variable, though all have the dephlogiſticated acid for the ground. Thus Dr Prieſtley, having expoſed ſtrong pale-yellow nitrous acid, whoſe ſpecific gravity could not be leſs than 1.400 to nitrous air, found that 100 grains of this acid abſorbed, in two days, 247 cubic inches of nitrous air: now, 100 grains of this ſpirit muſt have contained, by my calculation, about 21 grains of dry acid, and theſe 21 grains took up 91.39 grains of nitrous air. When about 20 cubic inches of nitrous air were abſorbed (that is, about ſeven grains), the acid became of an orange colour; when 50 cubic inches were abſorbed (about 18 grains), it became green; and when nearly the whole was abſorbed, it evaporated in the form of nitrous vapour, carrying off part of the water with it. Hence we ſee, that nitrous vapour conſiſts of nitrous acid united to three or four times its weight of nitrous air and a little water."

9
Mr Lavoiſier's theory conteſted.

Mr Kirwan next proceeds to conteſt Mr Lavoiſier's opinion, that nitrous air is a conſtituent principle of the nitrous acid. "The following experiments (ſays he) ſhow that nitrous air is not a conſtituent principle of the nitrous acid, but that fixed air is. 1. There is not a doubt but that pure nitrous acid enters entire, and without decompoſition, into fixed alkalis, and forms nitre. Now if nitre be diſtilled in a good earthen retort, it will be wholly decompoſed; and ſo alſo will the acid itſelf, except a few drops which paſs in the beginning of the diſtillation, and nothing but dephlogiſticated air, more or leſs pure, and conſequently intermixed with phlogiſticated air and a ſlight proportion of fixed air, will be found: theſe, therefore, are its true conſtituent parts when diſengaged from ſubſtances that cannot communicate phlogiſton to it in any remarkable quantity, ſuch as alkalis and earths; but if it be ſeparated from ſubſtances that contain phlogiſton, ſuch as metals, it will then indeed be reſolved into nitrous air, and dephlogiſticated air, more or leſs pure, the phlogiſton of the fixed air being detained by the metal. Mr Berthollet, who ſeems to have made the experiment with the greateſt exactneſs, produced 714 cubic inches of dephlogiſticated air from a Troy ounce of nitre. This, however, was far from being of the pureſt kind; and Dr Prieſtley, Mr Berthollet, and Mr Succow, obſerved, that the air which firſt paſſes contains fixed air, and renders lime-water turbid. Here then we have three of the conſtituent parts of the nitrous acid, with ſcarce any nitrous air; which the antiphlogiſtians ſuppoſe to be one of the conſtituent parts of the acid, and to make two thirds of its bulk when exhibited in an aerial form."

To obviate an objection that the quantity of fixed air thus obtained is too ſmall to deſerve to be ranked among the conſtituent parts of the nitrous acid, Mr Kirwan firſt inquires in what proportion it ought to exiſt there; and though this is variable, according to the different ſtates of the nitrous acid with reſpect to phlogiſtication, he reckons it at one-third of the acid as exiſting in the nitre; and, from the decompoſition of

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* Eſſay, p. 29.

this fixed air, and the phlogiſton emitted by it of conſequence, he attributes the phlogiſtication and redneſs of the nitrous acid when expoſed to more heat. As a proof that fixed air may be decompoſed in this manner, he adduces two experiments of Dr Prieſtley. In one of theſe, dephlogiſticated air was obtained by means of acetous acid in that concentrated ſtate in which it is called *radical vinegar*. Having mixed half an ounce of the acid with two ounces of calcined whiting, he obtained from it 350 ounce-meaſures of air; of which about one-third was fixed more in the firſt portion, and leſs in the laſt. The ſtandard of the reſiduum in the firſt portion was, 1.66, in the ſecond, 1.42, and in the third, 1.38; which is very near the goodneſs of common air. The whiting then weighed 760 grains. On adding a quarter of an ounce more of radical vinegar, and repeating the operation, 120 ounce-meaſures of air were obtained, and the whiting was reduced to 730 grains. A third operation, in which another quarter of an ounce of vinegar was added, reduced the matter to 489 grains; but the laſt portion of air extracted had no fixed air, and was conſiderably better than that of the atmoſphere.——The other experiment was made with lime-ſtone alone; from four ounces of the *white cryſtals* of which, 830 ounce-meaſures of air were obtained, the firſt portion of which had only one-fourth of fixed air, and the ſtandard of the reſiduum was never better than 1.56, nor worſe than 1.66; ſo that it was nearly of the goodneſs of common air.

10 Fixed air one of the elements of nitrous acid

11 How nitrous acid is naturally generated.

Our author then proceeds to relate ſeveral other experiments in which the nitrous acid was decompoſed; but a particular relation of them would ſwell this article beyond its due bounds. At laſt, however, he concludes in the following manner. "If ſpirit of nitre be made to boil, and its vapour received through a red-hot earthen tube, it will be converted into dephlogiſticated air, in which a portion both of phlogiſticated and fixed air is found, as Dr Prieſtley has diſcovered: the water through which this air paſſes will alſo contain fixed air. Here then are ſeveral ways of decompoſing the nitrous acid; and in one only it is reſolved into nitrous and dephlogiſticated air; and in this way it may, at leaſt, be ſtrongly ſuſpected to receive an addition of another principle. Why then ſhould theſe be regarded as its conſtituent principles? And as in the two ſimpleſt methods of decompoſition, in which the reaction of no foreign ſubſtance can be ſuſpected, it appears in the form of dephlogiſticated, phlogiſticated, and fixed air (the former always containing a portion of the two laſt), why then ſhould not theſe be accounted its true conſtituent parts?——This theory is further confirmed by reflecting on the manner in which nitrous acid is generated by nature. Mr. Thouvenel found that this acid is conſtantly produced when chalk is expoſed to a mixture of putrid air and common air, or putrid and dephlogiſticated air; but if the putrid air be paſſed through lime-water, it is never generated; and that it is rarely produced by the expoſure of quick-lime or fixed alkalis to theſe airs. The reaſon that alkalis, though aërated, are not ſo proper, is, that they do not combine with phlogiſticated air as calcareous earths do. Mr. Cavendiſh, indeed, produced nitrous acid without any apparent mixture of fixed air; but the atom of it neceſſary for the formation of the ſmall quantity of nitrous acid he produced (about one-third of a grain), might well be contained in the phlogiſticated air he employed, or perhaps formed in the operation."

12 Experiments by Mr Watt, which ſeem contrary to Mr Kirwan's doctrine.

Having thus far ſtated the different opinions of the moſt celebrated French and Engliſh philoſophers concerning the compoſition of acids, it is neceſſary to take notice of ſome experiments made by Mr Watt, in order to determine whether the dephlogiſticated air produced from nitre really proceeds from a decompoſition of the acid, or what quantity of the latter is required to conſtitute a determinate quantity of the former. To aſcertain this,* 240 grains of mercury were put into a glaſs retort with 480 grains of diluted dephlogiſticated nitrous acid, which was the quantity neceſſary to diſſolve the whole of the mercury; and as ſoon as the common air was expelled, a proper veſſel was applied to receive the air produced in the operation. Sixteen ounce-meaſures of nitrous air came over during the ſolution, and on changing the receiver, a quantity of dilute, but highly phlogiſticated nitrous acid, was obtained. The air receiver being again applied, four ounce-meaſures of ſtrong and pure nitrous air were obtained, which, by the dephlogiſticated air that aroſe immediately after, were reduced to half an ounce meaſure. The production of dephlogiſticated air continued very rapid, the mercury being all the while received, until the operation was ended by the diſtillation or ſublimation of the whole of the mercury. Two hundred and eighteen grains of the metal were obtained in its running form, and 22 remained in the form of an orange-coloured ſublimate in the upper part of the retort.—The 16 ounce-meaſures of nitrous air, firſt obtained, were then converted into nitrous acid by the gradual admiſſion of common air, and then added to the water in the baſon in which the receiver had been inverted; the whole quantity being about two quarts, and very acid to the taſte, ſparkling at the ſame time with nitrous air. To determine the quantity of acid thus recovered, as well as that which remained in the ſublimate, a ſolution of alkali of tartar was made; and by experiment it was found, that 120 grains of the acid, originally employed in diſſolving the mercury, ſaturated 352 grains of this ſolution; the orange coloured ſublimate and all the acid liquor recovered being ſaturated by 1395 grains of the ſame. Hence it appears, by the rule of proportion, that out of 480 grains of nitrous acid originally employed, only five were loſt; "a ſmaller quantity (as Mr Watt juſtly obſerves) than what might reaſonably be ſuppoſed to be loſt in the proceſs by the extreme volatility of the nitrous acid." His concluſion therefore is, that "the nitrous acid does not enter into the compoſition of dephlogiſticated air; it ſeems only to ſerve to abſorb phlogiſton from the watery part of the mercurial nitre."

This experiment was repeated with cubic nitre, and only 30 ounce-meaſures of air diſtilled from an ounce of the mineral alkali exactly ſaturated with nitrous acid. The water through which the air paſſed was acid, and the reſiduum in the retort alkaline; but on mixing the two together, the ſolution was found to be exactly neutral by every poſſible teſt.

Not ſatisfied with theſe experiments, Mr Watt diſtilled an ounce (480 grains) of common nitre, ſtopping the proceſs when 50 ounce-meaſures of air had been produced. This air had a ſtrong ſmell of the nitrous acid, from which it could not be freed by waſhing with the water in the baſon. The reſiduum in the retort was alkaline as before, and the water ſlightly acid; nor was the ſaturation completed by mixing the two together. Ten grains of weak nitrous acid, 105 grains of which contained the acid of 60 of nitre, completed the ſaturation. Theſe ten grains contained the acid of 57 grains of nitre; which, by Mr. Kirwan's experiments, is equal to two grains of real nitrous acid. "We have therefore (ſays Mr. Watt) 34 grains weight of dephlogiſticated air produced, and only two grains of real acid miſſing; and it is not certain that even this quantity was deſtroyed, becauſe ſome portion of the glaſs of the retort was diſſolved by the nitre, and ſome part of the materials employed in making the glaſs being alkali, we may conclude, that the alkali of the nitre would be augmented by the alkali of that part of the glaſs it had diſſolved; but as the glaſs cracked into ſmall pieces on cooling, and ſome part of the coating adhered firmly to it, the quantity of the glaſs that was diſſolved could not be aſcertained."

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* Philoſ. Tranſact. v. lxxiv. p. 339.

13
Anſwered by Mr Kirwan.

To avoid the force of objections drawn from theſe experiments, and which ſeem ready to overthrow his hypotheſis, as well as that of Mr Lavoiſier entirely, Mr Kirwan makes the following reply.——"My ingenious friend Mr Watt, as well as Mr Cavendiſh, are of opinion, that the whole quantity of dephlogiſticated air, produced from the diſtillation of nitre, ariſes from the dephlogiſtication of the water it contains, it being decompoſed by the nitrous acid, which then becomes phlogiſticated. This opinion is expoſed to inſurmountable difficulties. For, in the firſt place, nitre affords dephlogiſticated air at the rate of 146.125 cubic inches for every 100 grains of nitre, which, by the proper allowances for phlogiſticated air, ſhould weigh 46.77 grains: but then dephlogiſticated air is only one of the conſtituent parts of water, for it contains 13 *per cent.* of inflammable air, that is to ſay, 87 grains of dephlogiſticated air: to form 100 grains of water requires an addition of 13 grains of inflammable air; conſequently 46.77 grains of dephlogiſticated air require nearly 7 of inflammable air, and would then form 53.77 grains of water, which exceeds half the weight of the nitre; a quantity of water, as Mr Watt owns, certainly inadmiſſible.—Mr Watt found, that the water over which the air proceeding from the decompoſition of 960 grains of nitre had been received, contained only the acid belonging to 120 grains of nitre; and even this ſmall quantity he inferred only from my experiments. But my experiments are totally inapplicable in this caſe; for I uſed only the dephlogiſticated nitrous acid: and alkalis are ſaturable by a much ſmaller quantity of phlogiſticated than of dephlogiſticated acids, as is evident in the caſe of the *dephlogiſticated marine* acid, as Stahl long ago obſerved; for he ſays that the volatile acid of ſulphur ſaturates 10 times as much alkali as the fixed. Mr Bergman and Mr Scheele obſerved, that melted nitre is ſtill neutral, though it be phlogiſticated; therefore it is air, and not water, which it wants. Accordingly Dr Prieſtley found it to injure common air by attracting its dephlogiſticated part: but if it be kept in fuſion for ſome time, it loſes its acid, and becomes alkaline; and the air it receives muſt ſurely be deemed rather to recompoſe the acid than to form water; of whoſe formation, in the temperature of the atmoſphere, we have no ſort of proof. On the contrary, the impoſſibility of accounting for the loſs of acid in this caſe is an evident proof of the fallacy of that hypotheſis. —By Mr Lavoiſier's analyſis, 100 grains of nitre contain 57 of cauſtic alkali; by Mr Bergman's, 49; by Mr Wenzel's, 52; by Mr Weigleb's, 46½; by mine, 63: the mean of all which is, 53½; which leaves 46.5 for acid and water, which is very nearly the weight of the air expelled. The different quantity of acid aſſigned by different perſons to nitre, is in part owing to its degree of phlogiſtication in nitre. I believe at preſent, that 100 grains of nitre contain 34 of acid and about 12 of water, including the water in the acid and that of cryſtallization."

14
Quantity of acid contained in nitre.

15
Principles of the marine acid.

Mr Kirwan next proceeds to conſider, in a manner ſimilar to that above related, the compoſition of the other acids.—The marine acid, according to him, conſiſts of a peculiar baſis united to phlogiſton, and a certain quantity of fixed air; to both of which the baſis ſeems to have a ſtrong affinity. On depriving it of this phlogiſton, the affinity of the acid to fixed air becomes much ſtronger, and it ſaturates itſelf ſo largely with it, that its attractions for other ſubſtances, containing little or no phlogiſton, become nearly as weak as thoſe of fixed air itſelf when equally condenſed; but with reſpect to bodies that contain a conſiderable quantity of phlogiſton, its affinities are much ſtronger, as its baſis attracts the phlogiſton, while thoſe bodies attract its exceſs of fixed air. In this ſtate it does not expel fixed air from aërated fixed alkalis or earths until it is heated; and then dephlogiſticated air ſeparates from it, and it becomes, in all reſpects, common marine acid. For as it contains an exceſs of fixed air, it acts nearly as an acid of the ſame nature; but when heat is applied, its baſis dephlogiſticates its own fixed air, which then becomes dephlogiſticated air, at the ſame time that the acid becomes common marine acid, and acts as ſuch.

16
Mr Lavoiſier's opinion.

Mr Lavoiſier, and other philoſophers, who deny the exiſtence of phlogiſton, are of opinion, that the common marine acid conſiſts of a peculiar baſis united to a ſmall proportion of pure air, or oxygenous principle, and the dephlogiſticated marine acid differs from it only by containing an exceſs of this principle.—This opinion they are chiefly induced to maintain, becauſe the acid in its dephlogiſticated ſtate is procured by diſtilling common marine acid from manganeſe; and the manganeſe, if diſtilled by itſelf, before the acid is diſtilled from it, affords dephlogiſticated air; but after the acid is diſtilled from it, it yields none.—"This experiment, however, (ſays Mr Kirwan), proves no more but that the manganeſe contains ſome air which is dephlogiſticated during the calcination. And that this air is fixed air, appears from the following conſiderations: The black calx of manganeſe almoſt always gives out fixed air at firſt, before any dephlogiſticatad air appears; whence it is natural to think, that the dephlogiſticated air proceeds from the dephlogiſtication of the fixed. And hence, if it be diſtilled with filings of iron, or in a gun-barrel, it ſcarce gives out any other than fixed air; if at any time it gives out dephlogiſticated air, with little or no mixture of fixed air, this is owing to a very perfect dephlogiſtication of the calx, and to its containing very little moiſture. Thus Dr Prieſtley, having

17
Conteſted by Mr Kirwan.

having paſſed the ſteam of boiling water through manganeſe heated in an earthen tube, obtained a very large quantity of fixed air, and ſcarce any other; though on repeating this experiment with manganeſe well freed from calcareous earth, I obtained a large portion of dephlogiſticated air; but I believe much depends on the degree of heat to which the tube is ſubjected. But having diſtilled manganeſe, which yielded of itſelf ſome fixed air with common ſpirit of ſalt, I obtained dephlogiſticated marine acid, and not a particle of fixed air; which ſhows that this laſt combined with the dephlogiſticated baſis, and formed the dephlogiſticated acid. Mr Hermſtadt having diſſolved the black calx in common marine acid, and precipitated it with an aërated fixed alkali, obtained, as uſual, a white precipitate; which, when heated, afforded a great part of the fixed air it had abſorbed from the alkali; but when heated to ſuch a degree as to be of a brown red colour, and conſequently dephlogiſticated, it converted common ſpirit of ſalt into a dephlogiſticated acid, which could proceed only from ſome fixed air yet unexpelled: Yet if ſal-ammoniac be diſtilled with the black calx of manganeſe, it will be expelled in a cauſtic ſtate; for the fixed air unites to the dephlogiſticated marine baſis in preference to the volatil alkali."

18
Deciſive experiment in his favour.

Several other experiments are related by Mr Kirwan, which the limits of this article will not allow us to inſert; but the following, he is of opinion, fully confirms his hypotheſis, and ſubverts that of the antiphlogiſtians. "Six cubic inches of inflammable air were mixed with as much dephlogiſticated marine air over lime-water. In about 10 minutes after the greater part of the diminution had taken place, a white cloud appeared on the ſurface(*a*) of the lime-water, and by agitation it became ſtill more turbid. As it was poſſible that the manganeſe might be mixed with calcareous earth, ſome dephlogiſticated marine air was extracted from another portion of it, and received on lime-water; but it was wholly abſorbed, without forming the leaſt cloud, tho' there was lime enough; for on adding aërated water, a cloud appeared."

19
Phoſphoric acid.

The other acids particularly treated of by Mr Kirwan are the phoſphoric and ſaccharine. In his treatiſe on the former, he adopts the analyſis of Mr Lavoiſier, changing only his acid principle of dephlogiſticated for fixed air. From this it appears, that the phoſphoric acid conſiſts of a peculiar baſis united to 2.265 of its weight of the acid principle; or, in other words, 100 grains of dry phoſphoric acid contains about 69 of fixed air and 31 of its peculiar baſis: 100 grains of the phoſphoric baſis take up 226.5 of fixed air, or 32.9 of phlogiſton when it becomes phoſphorous; and 100 grains of phoſphorus contain 75.24 of baſis and 24.76 of phlogiſton.—The baſis of this acid is the only one that can be procured free, both from the phlogiſton and the acidifying principle; it is called, though improperly, as it is not ſoluble in water, the *glacial phoſphoric* acid. Mr Lavoiſier and others are of opinion, that phoſphorus is a ſimple ſubſtance containing no phlogiſton, and that the acid conſiſts of the oxygenous principle united to it.

20
Saccharine acid.

With regard to the acid of ſugar, Mr Kirwan obſerves, that ſugar itſelf is a compound of fixed air with a much larger proportion of inflammable air, and ſome water, all condenſed to a degree of which we are ignorant, but retaining, upon the whole, much more ſpecific heat than either oil or charcoal; though he ſeems inclined to the hypotheſis of Mr Morveau, that this ſubſtance has for its baſis a fine ethereal oil, to which a large proportion of condenſed inflammable air is ſuperadded. The acid of ſugar, then, according to him, conſiſts of this peculiar baſis deprived of its ſuperfluous phlogiſton, and united to a great quantity of fixed air in a concrete ſtate. He is alſo of opinion, that it does not exiſt ready formed in the ſugar, but is produced in the operations that ſubſtance undergoes: that it derives moſt of its acid principle from the nitrous acid employed; the nitrous baſis taking up the phlogiſton, and the fixed air of the nitrous acid combining with the ſaccharine baſis. He conteſts ſtrongly an opinion of Mr Lavoiſier, that ſugar is a ſort of *charcoal*, which, uniting with the oxygenous principle of the nitrous acid, decompoſes it, ſets looſe the nitrous air, and forms the ſaccharine acid; and that towards the end of the operation, the ſaccharine acid itſelf is decompoſed; the conſequence of which is, the production of fixed air, which, according to him, is only the oxygenous principle combined with charcoal. On this Mr Kirwan remarks, 1. "That, according to this theory, the acid of ſugar ſhould be the ſame with fixed air, ſince both are compoſed of the oxygenous principle united with charcoal: or, if Mr Lavoiſier ſhould reply, that ſugar is different from common charcoal, he reminds him, that, according to his own table of affinities, the oxygenous principle has a much ſtronger attraction for charcoal than for ſugar, and conſequently that the latter ought to be decompoſed by the former: nay, that it ſhould be regenerated by various metallic ſubſtances, which, according to him, have a greater attraction for this principle. 2. According to this hypotheſis, the ſaccharine acid ought to weigh more than the ſugar employed in the operation; which is ſo far from being the caſe, that it is univerſally agreed to be much leſs; Bergman making it only $\frac{1}{3}$d, Mr Chaptal from $\frac{1}{3}$d to $\frac{2}{5}$ths, and Mr Sage $\frac{10}{16}$ths. 3. If the ſaccharine acid conſiſted of ſugar, or conſiſted of that ſubſtance undecompoſed, and barely united to the oxygenous principle, it ought to be formed by treating ſugar with the black calx of manganeſe, or with dephlogiſticated marine acid; both of which, according to him, have leſs attraction for the oxygenous principle than ſugar. Laſtly (ſays Mr Kirwan), If the acid of ſugar be diſtilled, it is wholly converted into water, fixed inflammable air, and not a particle of coal or dephlogiſticated air is found in it. It is not therefore reaſonable to look on either of them as its conſtituent principles; but as fixed air alone can be extracted from all vegetable acids, it ſeems to be the true acidifiable principle."

21
Fixed air the acid principle, according to Mr Kirwan.

Having given a view of the preſent opinions relative to the original formation of acids, it remains to treat a little more particularly of each of the different kinds.

(*a*) On mixing theſe, a denſe white cloud appears; one half of the bulk of both diſappears, and the reſiduum explodes like a mixture of inflammable and dephlogiſticated air.

22 Acids, how divided.

23 Enumeration.

kinds. They are divided into three different claſſes, expreſſive of their origin, *viz.* the Mineral, Vegetable, and Animal. The mineral acids are thoſe of vitriol, nitre, ſea-ſalt, borax, amber, fluor, arſenic, tungſten, molybdæna, &c. The vegetable are, thoſe of vinegar, tartar, ſugar, benzoin, apples, citrons, lemons, tamarinds, ſorrel, cork, &c. The animal acids are, the microſmic or acid of urine, and that of bones, both of which are alſo called the *phoſphoric,* though this might be accounted a vegetable acid, as it is procured by diſtilling muſtard and ſome other vegetables by a violent fire. Beſides theſe, there are the acids of ants, waſps, bees, ſilk-worms, milk, &c. It has alſo been diſcovered, that the human calculus is formed for the moſt part of a peculiar acid, which has received the name of *lithiaſic* acid. Laſtly, As an acid diſtinct from all theſe, we may now add *fixed air,* by ſome called the *aerial,* and by others the *cretaceous* acid; the latter appellation it derives from *creta,* chalk, becauſe it is found in that ſubſtance in great quantity. See Aerology.

24 General account of their attractions for alkalis, &c.

The general properties of acids have already been enumerated; the moſt remarkable of which is their attraction for alkaline ſalts, earth, and metals. Though this is common to all, yet very conſiderable differences are obſerved among them in this reſpect, and on thoſe differences depend almoſt all the phenomena of that part of Chemistry which treats of ſalts. As theſe phenomena are particularly conſidered under that article, we ſhall here only in general take notice, that the three acids named the *vitriolic, nitrous,* and *marine,* are the ſtrongeſt of them all; that is, if any other acid be united to an alkali, earth, or metal, the union will be broken by adding to that compound any of the three acids juſt mentioned. Neither are theſe equal in power among themſelves; for the vitriolic is ſtronger than the nitrous, and the nitrous ſtronger than the marine. The rule, however, is liable to certain exceptions and variations, depending chiefly on the circumſtances of heat or cold, moiſture or dryneſs, and particularly on the ſtate of the marine acid with regard to its being in the form of an aqueous fluid or reduced to a dry vapour. In this laſt caſe it ſeems ſtronger than either the vitriolic or nitrous; and even when in an acqueous ſtate, both the nitrous and marine acids, when added in great quantity, ſeem to oppreſs and overwhelm the ſtronger vitriolic acid, ſo that they will partly expel it from an alkaline ſalt. This does not depend on the mere quantity of acidity they poſſeſs: for the acetous acid may be concentrated to ſuch a degree as to become ſtronger in this reſpect than ſpirit of ſalt; yet it will always be inferior in point of real ſtrength, when tried with an alkali in competition with the latter. The aerial acid is the weakeſt of all; and may be expelled not only by vinegar, but by the acid juices of fruits, tartar, and the acids of tungſten and molybdæna.

Some acids have the property of reſiſting the fire, and melting into a kind of glaſs, ſuch as that of borax and phoſphorus. This circumſtance gives them an advantage over the ſtronger acids which are volatile; and thus the two juſt mentioned, as well as thoſe of arſenic and tungſten, will, in a very ſtrong heat, expel the acid of vitriol itſelf, though the latter will, in the cold, expel any one of them with great eaſe.

Both the vitriolic and nitrous acids have a very ſtrong attraction for phlogiſton; and unite with certain oily and inflammable matter ſo vehemently as to occaſion great heat, and ſometimes even violent and unextinguiſhable flame. This is particularly the caſe with the nitrous acid, or with a mixture of the two; and indeed the nitrous acid, though weaker than the vitriolic, ſhows itſelf in every inſtance to be far more active, and to perform all its operations with vaſtly greater rapidity, than the other. All theſe particulars, however, as they properly fall under the article Chemistry, are there explained at length: together with the origin and peculiar methods of preparing each of the acids, and the various uſes to which they may be applied in arts and manufactures. See alſo their different titles as they occur in the order of the alphabet; as, Nitre, Vinegar, Vitriol, &c.

ACIDULOUS denotes a thing that is ſlightly *acid;* it is ſynonymous with the word *ſub-acid.*

ACIDULÆ. Mineral waters that contain a briſk ſpirit, when unaccompanied with heat, are thus named; but if they are hot alſo they are called Thermae. See Mineral Waters.

ACIDULATED, a name given to medicines that have an acid in their compoſition.

ACIDUM aereum, the ſame with *Fixed Air.*

Acidum pingue, an imaginary acid, which ſome German chemiſts ſuppoſe to be contained in fire, and by combining with alkalis, lime, &c. to give them their cauſtic properties; an effect which is found certainly to depend on the loſs of their fixed air.

ACILA, Ocila, or Ocelis (anc. geog.), a ſtaple or mart town in Arabia Felix, on the Arabic gulf, from which, according to Pliny, they ſet ſail for India. Now *Ziden.*

ACILIUS GLABRIO (Marcus) conſul in the year of Rome 562, and 211 years before the Chriſtian æra, diſtinguiſhed himſelf by his bravery and conduct in gaining a complete victory over Antiochus the Great, king of Syria, at the ſtreights of Thermopylæ in Theſſaly, and on ſeveral other occaſions. He built the Temple of Piety at Rome, in conſequence of a vow he made before the above mentioned battle: and the reaſon of his giving it that name is very remarkable. The ſtory is mentioned by Pliny, Valerius Maximus, and others. See the article Piety.

ACINIPPO (anc. geog.), a town of Bætica; its ruins, called *Ronda la Viega,* are to be ſeen near Arunda, in the kingdom of Granada.

ACINODENDRUM, in botany, the trivial name of a ſpecies of Melastoma.

ACINOS, in botany, the trivial name of a ſpecies of Thymus.

ACINUS, or Acini, the ſmall protuberances of mulberries, ſtrawberries, &c. and by ſome applied to grapes. Generally it is uſed for thoſe ſmall grains growing in bunches, after the manner of grapes, as *Liguſtrum,* &c.

ACIS, in fabulous hiſtory, the ſon of Faunus and Simetheis, was a beautiful ſhepherd of Sicily, who being beloved by Galatea, Polyphemus the giant was ſo enraged, that he daſhed out his brains againſt a rock; after which Galatea turned him into a river, which was called by his name.

Acis, (Ovid, Theocritus); a river of Sicily, running from a very cold ſpring, in the woody and ſhady foot of mount Ætna, eaſtward into, and not much above a mile from, the ſea, along green and pleaſant banks, with the ſpeed of an arrow, from which it takes its name. It is now called *Aci Iaci*, or *Chinci*, according to the different Sicilian dialects: Antonine calls it *Acius*. Alſo the name of a hamlet at the mouth of the *Acis*.

ACKNOWLEDGMENT, in a general ſenſe, is a perſon's owning or confeſſing a thing; but more particularly, is the expreſſion of gratitude for a favour.

Acknowledgment-Money, a certain ſum paid by tenants, in ſeveral parts of England, on the death of their landlords, as an acknowledgment of their new lords.

ACLIDES, in Roman antiquity, a kind of miſſive weapon, with a thong affixed to it, whereby to draw it back. Moſt authors deſcribe it as a kind of dart or javelin; but Scaliger makes it roundiſh or globular, and full of ſpikes, with a ſlender wooden ſtem to poiſe it by.

ACLOWA, in botany, a barbarous name of a ſpecies of Colutea. It is uſed by the natives of Guinea to cure the itch: They rub it on the body as we do unguents.

ACME, the top or height of any thing. It is uſually applied to the maturity of an animal juſt before it begins to decline; and phyſicians have uſed it to expreſs the utmoſt violence or criſis of a diſeaſe.

ACMELLA, in botany, the trivial name of a ſpecies of Spilanthus.

ACMONIA, and Agmonia, in Peutinger's map, a town of Phrygia Major, now in ruins. The inhabitants are called *Acmonenſes* by Cicero, and the city *Civitas Acmonenſis*. Alſo a city of Dacia (Ptolemy), on the Danube, near the ruins of Trajan's bridge, built by Severus, and called *Severicum;* diſtant 12 German miles from Temeſwar, to the ſouth-eaſt.

ACNIDA, Virginian Hemp, in botany, a genus of the diœcia order, belonging to the pentandria claſs of plants; and, in the Natural Order, aſſociating with the *Scabridæ* (53). The characters are: In the *male*, the *calyx* is a perianthium conſiſting of five leaves, ovate, concave, acute, and membranous on the margin. No *corolla*. The *ſtamina* conſiſt of five very ſhort capillary filaments; the antheræ are verſatile, two-celled, and forked at both ends.—*Female* on a ſeparate plant; of which the *calyx* conſiſts of an involucrum many-leav'd, linear, and deciduous; and a perianthium two-leav'd, very ſmall, and perſiſtent. No *corolla*. The *piſtillum* has an ovate germen; the ſtyli are five, long, reflected, and downy; the ſtigmata are ſimple. The *pericarpium* is an egg-ſhaped fruit, compreſſed, many-angled, ſulcated, and covered with a ſucculent calyx. The *ſeed* is ſolitary, round, and compreſſed. There is only one ſpecies of it, *viz.* the acnida cannabida. It is a native of Virginia; but rarely cultivated in Europe, except for the ſake of variety. It has little beauty, and at preſent is applied to no uſeful purpoſe.

ACNUA, in Roman antiquity, ſignified a certain meaſure of land, near about the Engliſh rood, or fourth part of an acre.

ACOEMETÆ, or Acoemeti, in church-hiſtory; or, Men who lived without ſleep: A ſet of monks who chanted the divine ſervice night and day in their places of worſhip. They divided themſelves into three bodies, who alternately ſucceeded each other, ſo that their churches were never ſilent. This practice they founded upon the precept, *Pray without ceaſing*. They flouriſhed in the eaſt about the middle of the 5th century. There are a kind of acoemeti ſtill ſubſiſting in the Roman church, *viz.* the religious of the holy ſacrament, who keep up a perpetual adoration, ſome one or other of them praying before the holy ſacrament day and night.

ACOLUTHI, or Acoluthists, in antiquity, was an appellation given to thoſe perſons who were ſteady and immovable in their reſolutions: and hence the ſtoics, becauſe they would not forſake their principles, nor alter their reſolutions, acquired the title of Acoluthi. The word is Greek, and compounded of α, priv. and κογευθος, way; as never turning from the original courſe.

Acoluthi, among the ancient Chriſtians, implied a peculiar order of the inferior clergy in the Latin church; for they were unknown to the Greeks for above 400 years. They were next to the ſub-deacon; and we learn from the fourth council of Carthage, that the archdeacon, at their ordination, put into their hands a candleſtick with a taper, giving them thereby to underſtand that they were appointed to light the candles of the church; as alſo an empty pitcher, to imply that they were to furniſh wine for the euchariſt. Some think they had another office, that of attending the biſhop wherever he went. The word is Greek, and compounded of α, priv. and κωλυω, to hinder or diſturb.

ACOLYTHIA, in the Greek church, denotes the office or order of divine ſervice; or the prayers, ceremonies, hymns, &c. whereof the Greek ſervice is compoſed.

ACOMA, a town of North-America, in New-Mexico, ſeated on a hill, with a good caſtle. To go into the town, you muſt walk up 50 ſteps cut out of the rock. It is the capital of that province, and was taken by the Spaniards in 1599. W. Long. 104. 15. Lat. 35. 0.

ACOMAC, or Accomack, the name of a county in Virginia. It is on the eaſtern ſide of the Cheſapeak bay, on a ſlip of land called the *eaſtern ſhore*.

ACOMINATUS (Nicetas), was ſecretary to Alexius Comnenus and to Iſaacus Angelus ſucceſſively: he wrote an hiſtory from the death of Alexius Comnenus 1118, where Zonaras ended his, to the year 1203, which has undergone many impreſſions, and is much applauded by the beſt critics.

ACONITE. See Aconitum.

Winter Aconite. See Helleborus.

ACONCROBA, in botany, the indigenous name of a plant which grows wild in Guinea, and is in great eſteem among the natives for its virtues in the ſmall-pox. They give an infuſion of it in wine. The leaves of this plant are opake, and as ſtiff as thoſe of the philyrea; they grow in pairs, and ſtand on ſhort footſtalks; they are ſmall at each end, and broad in the middle; and the largeſt of them are about three inches in length, and an inch and quarter in breadth in the middle. They are of a duſky colour on the upper ſide, and of a pale green underneath.

ACONITI, in antiquity, an appellation given to ſome of the ATHLETÆ, but differently interpreted. Mercurialis underſtands it of thoſe who only anointed their bodies with oil, but did not ſmear themſelves over with duſt, as was the uſual practice.

ACONITUM, ACONITE, WOLFSBANE, or MONKSHOOD; a genus of the trigynia order, belonging to the polyandria claſs of plants. In the natural order, it aſſociates with the *Multiſiliquæ*, 26. The characters are: There is no *calyx*. The *corolla* conſiſts of five unequal petals oppoſite in pairs; the higheſt helmet-tubed, inverted, and obtuſe; the two lateral ones, broad, roundiſh, oppoſite, and converging; the two loweſt, oblong, and looking downwards: The nectaria are two, piped, nodding, and ſitting on long ſubulated peduncles, and concealed under the higheſt petal: The ſcales are ſix, very ſhort, coloured, and in an orb with the nectaria. The *ſtamina* conſiſt of numerous ſmall ſubulated filaments; the antheræ are erect and ſmall. The *piſtillum* has three [five] oblong germens, ending in ſtyli the length of the ſtamina; the ſtigmata are ſimple and reflected. The *pericarpium* has three or five univalve capſules gaping inward. The *ſeeds* are numerous, angular, and wrinkled.

Species. 1. The lycoctonum, or yellow wolfsbane, grows upwards of three feet high, flowers about the middle of June, and if the ſeaſon is not warm will continue in flower till Auguſt. 2. The altiſſimum, or greateſt yellow wolfsbane, grows upwards of four feet high, and the ſpikes of its flower are much longer in this ſort than the former. 3. The variegatum, or leſſer wolfsbane, ſeldom grows more than two feet high; it carries blue flowers, and the ſpikes of them are much ſhorter than either of the two laſt. 4. The anthora, or wholeſome wolfsbane, flowers in the middle of Auguſt, and often continues in beauty till the middle of September; its flowers are not large, but are of a beautiful ſulphur-yellow colour. 5. The napellus, bears large blue flowers, which appear in Auguſt, and make a pretty appearance. There are two or three varieties of this kind; one with white, another with roſe-coloured, and a third with variegated flowers; but theſe are only varieties which often change. 6. The pyramidale, or common blue monkſhood, bears a long ſpike of blue flowers, which appear ſooner than any of the other ſorts, being ſo early as June, or ſometimes even May. The ſpikes of flowers are upwards of two feet long, ſo that it makes a pretty appearance; the ſeeds are ripe in September. 7. The alpinum, or large-flowered monkſhood, flowers in Auguſt, and will grow to the height of five feet in good ground; the flowers are very large, of a deep blue colour, but not many upon each ſpike. 8. The pyreniacum, or Pyrenean monkſhood, flowers in July. It grows about four feet high, and carries a long ſpike of yellow flowers. 9. The cammarum, grows about four feet high, and flowers in the beginning of July. 10. The orientale, or eaſtern monkſhood, grows ſometimes more than ſix feet high, and bears a white flower.

Culture. All theſe ſpecies, except the laſt, are natives of the Alps, the mountains of Germany, Auſtria, and Tartary; ſo require a cool ſhady ſituation, except the wholeſome woolfsbane, which muſt have an open expoſure. They thrive better in a moiſt than dry ſoil: but the ground muſt not be ſo wet as to have the water ſtanding near their roots in the winter-time. They may all be propagated by ſowing their ſeeds in autumn, upon a north border, where they are ſcreened from the ſun. The plants will come up in the ſpring, when they muſt be kept clean from the weeds during the ſummer-months; and, in very dry ſeaſons, if they are frequently refreſhed with water, their growth will be greatly promoted. The following autumn they ſhould be tranſplanted into ſhady borders, in rows a foot aſunder, and the plants ſix inches diſtant from one another. In this ſituation they may remain two years, when they will carry flowers, and ſo may be tranſplanted to thoſe places where they are to remain. The eaſtern monkshood is a native of the Levant, from whence the ſeeds of it were firſt ſent by Dr Tournefort to the royal garden at Paris, from whence ſome other gardens have been furniſhed with ſeeds. It is very rare in Europe at preſent.

Qualities. Since the time of Theophraſtus, moſt of the ſpecies of monkſhood have been reckoned a deadly poiſon both to men and brutes. Dioſcorides, however, recommends the external application of common monkshood for pains of the eyes. The flowers of a great many ſpecies communicate their noxious quality by being ſmelled to; and thoſe of the ſpecies called *napellus* being placed on the head, occaſion a violent megrim. Of the bad qualities of theſe plants we ſometimes avail ourſelves to get rid of vermin. A decoction of the roots deſtroys bugs; the ſame part being powdered, and adminiſtered in bread or ſome other palatable vehicle to rats and mice, corrodes and inflames their inteſtines, and ſoon proves mortal. The juice of the plant is uſed to poiſon fleſh with, for the deſtruction of wolves, foxes, and other ravenous beaſts. The beſt antidote to the poiſon of the different monkshoods is ſaid to be the root of the anthora, a ſpecies of the ſame genus, hence termed *healthful* or *wholeſome monksſhood*. The ſame plant is regarded as efficacious againſt bites of ſerpents and other venomous creatures. The roots have a bitter acrid taſte; the leaves are only bitter: the former are chiefly uſed in medicine; and, beſides the excellent quality juſt mentioned, are ſtomachic, and promote perſpiration. The peaſants, who gather the plants on the Alps and Pyrenees, are ſaid to uſe it with ſucceſs againſt the biting of mad dogs, and to cure the colic. It is remarkable, that the monkshoods with blue flowers are much more virulent than the yellow or white-flowered kinds. Miller aſſerts that the huntſmen of the wolves and other wild beaſts on the Alps, dip their arrows into the juice of thoſe plants, which renders the wounds made by them deadly.

That the anthora is an antidote to the poiſon of the reſt of the ſpecies, is not conſidered as a fact ſufficiently eſtabliſhed. Of the effects of the above, indeed, and other vegetable poiſons, medical writers give but a confuſed account. In general, thoſe which are not of the narcotic kind, nor excite violent vomitings and purgings, produce their pernicious effects by irritating the nervous coats of the ſtomach and inteſtines, ſo as to occaſion violent convulſions, not only in them, but through the whole body. The proper cure is evacuation by vomit: but this is not to be obtained without ſome difficulty; becauſe there is uſually ſuch a contraction about the upper orifice of the ſtomach, that nothing

thing can either be ſwallowed or thrown up. In this caſe, an infuſion of tobacco has been recommended, and may probably be of ſervice: for being itſelf of a very ſtimulating nature, it may for a moment take off the violent ſpaſms occaſioned by the poiſon; in which caſe, a violent vomiting will immediately enſue.—The ſtomach being thoroughly emptied, and deglutition rendered eaſy, the cure may be completed by oily and mucilaginous medicines. On account of the poiſonous qualities of monkſhood, no ſpecies of it ſhould be planted where children have acceſs, leſt they ſhould ſuffer by putting the leaves or flowers in their mouths, or rubbing them about their eyes; for the juice of the leaves will occaſion great diſorder by being only rubbed upon very tender fleſh; and the farina of the flowers, when blown into the eyes, cauſes them to ſwell greatly.

ACONTIAS, in zoology, an obſolete name of the anguis jaculis, or dart-ſnake, belonging to the order of amphibia ſerpentes. See ANGUIS.

ACONTIUM, ακοντιον, in Grecian antiquity, a kind of dart or javelin, reſembling the Roman pilum.

ACONTIUS (James), a philoſopher, civilian, and divine, born at Trent in the 16th century: he embraced the reformed religion; and, coming into England in the reign of queen Elizabeth, was much honoured by her, which he acknowledges in a book dedicated to that queen. This work is his celebrated Collection of the Stratagems of Satan, which has been ſo often tranſlated, and borne ſo many editions.

ACOSTAN, a mountainous iſland in the north ſeas, between Aſia and America, obſerved by captain Cooke.

ACORN, the fruit of the oak-tree. See QUERCUS.

ACORN, (in ſea-language), a little ornamental piece of wood, faſhioned like a cone, and fixed on the uppermoſt point of the ſpindle, above the vane, on the maſthead. It is uſed to keep the vane from being blown off from the ſpindle in a whirlwind, or when the ſhip leans much to one ſide under ſail.

ACORUS, CALAMUS AROMATICUS, SWEET FLAG, or SWEET RUSH: A genus of the monogynia order, belonging to the hexandria claſs of plants; and ranking in the ſecond natural order, *Piperitæ*. The characters are: The *calyx* is a cylindric ſimple ſpadix covered with florets; there is no *ſpatha*, nor *perianthium*. The *corolla* is compoſed of ſix obtuſe, concave, looſe petals. The *ſtamina* conſiſt of ſix thickiſh filaments, ſomewhat longer than the corolla; the antheræ are thickiſh and didymous. The *piſtillum* has a gibbous oblong germen the length of the ſtamina; no ſtylus; the ſtigma a prominent point. The *pericarpium* is a ſhort triangular, obtuſe, three-celled capſule, attenuated at both ends. The *ſeeds* are numerous, and of an oblong egg-ſhape.

There is but one ſpecies, the acorus calamus. It grows naturally in ſhallow ſtanding waters, and is found wild in ſome parts of Britain. It grows plentifully in rivulets and marſhy places about Norwich and other parts of the iſland, in the canals of Holland, in Switzerland, and in other countries of Europe. The ſhops have been uſually ſupplied from the Levant with dried roots, which do not appear to be ſuperior to thoſe of other parts. The leaves are ſometimes two feet long, narrow, compreſſed, ſmooth, and of a bright green, terminating in a point; the root is pretty long, of a whitiſh, reddiſh, and partly greeniſh colour. Among the leaves there ariſes a ſingle one, thicker and more robuſt than the reſt, furrowed on the ſurface; and of a paler green. On this grow frequently two ſpikes of flowers, by many writers called *juli*. Theſe are of a brown colour, having a chequered ſurface. The root of this plant has a very agreeable flavour, which is greatly improved by drying. It is reckoned carminative and ſtomachic, having a warm, pungent, bitteriſh taſte; ſo is frequently uſed as an ingredient in bitters. It has been complained of, however, as communicating a nauſeous flavour to thoſe bitters in which it is infuſed; and Neumann obſerves, that its agreeable flavour, as well as its diſtinguiſhing taſte, reſides entirely in a volatile eſſential oil; the reſiduum after diſtillation having a nauſeous flavour, not at all reſembling that of the calamus. It is an ingredient in the mithridate and theriaca of the London pharmacopœia; and in the aromatic and ſtomachic tinctures, and compound arum powder, of the Edinburgh. The freſh root candied is ſaid to be employed at Conſtantinople as a preſervative againſt epidemic diſeaſes. The leaves of this plant have a ſweet fragrant ſmell, more agreeable, though weaker, than that of the roots. Neither horſes, cows, goats, ſheep, nor ſwine, will eat the herb, or its roots.

Culture. The acorus being a perennial plant, may be tranſplanted into a garden, where it will thrive very well if the ground is moiſt; but never flowers unleſs it grows in water. It loves an open ſituation, and will not thrive well under the ſhade of trees. The flowers appear the latter end of June, and continue till Auguſt.

ACORUS, in the materia medica, a name ſometimes given to the great galangal. See KEMPFERIA.

ACORUS, in natural hiſtory, blue coral. The true ſort is very ſcarce; ſome, however, is fiſhed on the coaſts of Africa, particularly from Rio Del Re to the river of the Camarones. This coral is part of the merchandiſe which the Dutch trade for with the Camarones; that of the kingdom of Benin is alſo very much eſteemed. It grows in form of a tree on a rocky bottom.

ACOUSMATICI, ſometimes alſo called *Acouſtici*, in Grecian antiquity, ſuch of the diſciples of Pythagoras as had not completed their five years probation.

ACOUSTIC, in general, denotes any thing that relates to the ear, the ſenſe of hearing, or the doctrine of ſounds.

ACOUSTIC *Duct*, in anatomy, the ſame with meatus auditorius, or the external paſſage of the ear. See ANATOMY.

ACOUSTIC Inſtrument, or auricular tube. See ACOUSTICS, n° 26.

ACOUSTIC Veſſels, in the ancient theatres, were a kind of veſſels, made of braſs, ſhaped in the bell faſhion, which being of all tones within the pitch of the voice or even of inſtruments, rendered the ſounds more audible, ſo that the actors could be heard through all parts of theatres, which were even 400 feet in diameter.

ACOUSTIC Diſciples, among the ancient Pythagoreans, thoſe more commonly called ACOUSMATICI.

The SCIENCE of

A C O U S T I C S

1 Diacouſtics. 2 Catacouſtics. INSTRUCTS us in the nature of ſound. It is divided by ſome writers into *Diacouſtics*, which explains the properties of thoſe ſounds that come directly from the ſonorous body to the ear; and *Catacouſtics*, which treats of reflected ſounds: but ſuch diſtinction does not appear to be of any real utility.

CHAP. I. *Different Theories of Sound.*

3 Of the vehicles of ſound. MOST ſounds, we all know, are conveyed to us on the boſom of the air. In whatever manner they either float upon it, or are propelled forward in it, certain it is, that without the vehicle of this or ſome other fluid, we ſhould have no ſounds at all. Let the air be exhauſted from a receiver, and a bell ſhall emit no ſound when rung in the void; for, as the air continues to grow leſs denſe, the ſound dies away in proportion, ſo that at laſt its ſtrongeſt vibrations are almoſt totally ſilent.

4 Air not the only one. Thus air is a vehicle for ſound. However, we muſt not, with ſome philoſophers, aſſert, that it is the only vehicle; that, if there were no air, we ſhould have no ſounds whatſoever: for it is found by trial, that ſounds are conveyed through water almoſt with the ſame facility with which they move through air. A bell rung in water returns a tone as diſtinct as if rung in air. This was obſerved by Derham, who alſo remarked that the tone came a quarter deeper. Some naturaliſts aſſure us alſo, that fiſhes have a ſtrong perception of ſounds, even at the bottom of deep rivers (A). From hence it would ſeem to be not very material in the propagation of ſounds, whether the fluid which conveys them be elaſtic or otherwiſe. Water, which, of all ſubſtances that we know, has the leaſt elaſticity, yet ſerves to carry them forward; and if we make allowance for the difference of its denſity, perhaps the ſounds move in it with a proportional rapidity to what they are found to do in the elaſtic fluid of air.

One thing however is certain, that whether the fluid which conveys the note be elaſtic or non-elaſtic, whatever ſound we hear is produced by a ſtroke, which the ſounding body makes againſt the fluid, whether air or water. The fluid being ſtruck upon, carries the impreſſion forward to the ear, and there produces its ſenſation. 5 What ſound is, and how propagated. Philoſophers are ſo far agreed, that they all allow that ſound is nothing more than the impreſſion made by an elaſtic body upon the air or water (B), and this impreſſion carried along by either fluid to the organ of hearing. But the manner in which this conveyance is made, is ſtill diſputed: Whether the ſound is diffuſed into the air, in circle beyond circle, like the waves of water when we diſturb the ſmoothneſs of its ſurface by dropping in a ſtone; or whether it travels along, like rays diffuſed from a centre, ſomewhat in the ſwift manner that electricity runs along a rod of iron; theſe are the queſtions which have divided the learned.

6 Newton's theory. Newton was of the firſt opinion. He has explained the progreſſion of ſound by an undulatory, or rather a vermicular, motion in the parts of the air. If we have an exact idea of the crawling of ſome inſects, we ſhall have a tolerable notion of the progreſſion of ſound upon this hypotheſis. The inſect, for inſtance, in its motion, firſt carries its contractions from the hinder part, in order to throw its fore-part to the proper diſtance, then it carries its contractions from the fore-part to the hinder to bring that forward. Something ſimilar to this is

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(A) Dr Hunter has proved this, and demonſtrated the auricular organ in theſe animals. See FISH, and COMPARATIVE *Anatomy*.

(B) Though air and water are both vehicles of ſound, yet neither of them ſeems to be ſo by itſelf, but only as it contains an exceedingly ſubtile fluid capable of penetrating the moſt ſolid bodies. Hence, by the medium of that fluid, ſounds can be propagated through wood, or metals, even more readily than through the open air. By the ſame means, deaf people may be made ſenſible of ſounds, if they hold a piece of metal in their mouth, one end of which is applied to the ſounding body. As it is certain, therefore, that air cannot penetrate metals, we muſt acknowledge the medium of ſound to be of a more ſubtile nature; and thus the electrical fluid will naturally occur as the proper one. But why then is ſound no longer heard in an exhauſted receiver, if the air is not the fluid by which it is conveyed, ſeeing the electrical matter cannot be excluded? The reply to this is obvious: The electrical fluid is ſo exceedingly ſubtile, and pervades ſolid bodies with ſo much eaſe, that any motion of a ſolid body in a quantity of electric matter by itſelf, can never excite a degree of agitation in it ſufficient for producing a ſound; but if the electric fluid is entangled among the particles of air, water, wood, metal, &c. whatever affects their particles will alſo affect this fluid, and produce an audible noiſe. In the experiment of the air-pump, however, there may be an ambiguity, as the gradual exhauſting of the air creates an increaſing difference of preſſure on the outſide, and may occaſion in the glaſs a difficulty of vibrating, ſo as to render it leſs fit to communicate to the air without the vibrations that ſtrike it from within. From this cauſe the diminution of ſound in an exhauſted receiver may be ſuppoſed to proceed, as well as from the diminution of the air. But if any internal agitation of its parts ſhould happen to the electrical fluid, exceeding loud noiſes might be propagated through it, as has been the caſe when large meteors have kindled at a great diſtance from the earth. It is alſo difficult to account for the exceeding great ſwiftneſs of ſound, upon the ſuppoſition that it is propagated by means of air alone; for nothing is more certain, than that the ſtrongeſt and moſt violent gale is, in its courſe, inert and ſluggiſh, compared with the motion of ſound.

Plate I. fig. 1.

is the motion of the air when ſtruck upon by a ſounding body. To be a little more preciſe, ſuppoſe ABC, the ſtring of an harpſichord ſcrewed to a proper pitch, and drawn out of the right line by the finger at B. We ſhall have occaſion elſewhere to obſerve, that ſuch a ſtring would, if let go, vibrate to E; and from E to D, and back again; that it would continue thus to vibrate like a pendulum for ever, if not externally reſiſted, and, like a pendulum, all its little vibrations would be performed in equal times, the laſt and the firſt being equally long in performing; alſo, that, like a pendulum, its greateſt ſwiftneſs would always be when it arrived at E, the middle part of its motion. Now then, if this ſtring be ſuppoſed to fly from the finger at B, it is obvious, that whatever be its own motion, ſuch alſo will be the motion of the parts of air that fly before it. Its motion, as is obvious, is firſt uniformly accelerated forward from B to E, then retarded as it goes from E to D, accelerated back again as it returns from D to E, and retarded from E to B. This motion being therefore ſent in ſucceſſion through a range of elaſtic air, it muſt happen that the parts of one range of air muſt be ſent forward with accelerated motion, and then with a retarded motion. This accelerated motion reaching the remoteſt end of the firſt range will be communicated to a ſecond range, while the neareſt parts of the firſt range being retarded in their motion, and falling back with the receſſion of the ſtring, retire firſt with an accelerated, then with a retarded motion, and the remoteſt parts will ſoon follow. In the mean time, while the parts of the firſt range are thus falling back, the parts of the ſecond range are going forward with an accelerated motion. Thus there will be an alternate condenſation and relaxation of the air, during the time of one vibration; and as the air going forward ſtrikes any oppoſing body with greater force than upon retiring, ſo each of theſe accelerated progreſſions have been called by Newton a *pulſe* of ſound.

Thus will the air be driven forward in the direction of the ſtring. But now we muſt obſerve, that theſe pulſes will move every way; for all motion impreſſed upon fluids in any direction whatſoever, operates all around in a ſphere: ſo that ſounds will be driven in all directions, backwards, forwards, upwards, downwards, and on every ſide. They will go on ſucceeding each other, one on the outſide of the other, like circles in diſturbed water; or rather, they will lie one without the other, in concentric ſhells, ſhell above ſhell, as we ſee in the coats of an onion.

All who have remarked the tone of a bell, while its ſounds are decaying away, muſt have an idea of the pulſes of ſound, which, according to Newton, are formed by the air's alternate progreſſion and receſſion. And it muſt be obſerved, that as each of theſe pulſes is formed by a ſingle vibration of the ſtring, they muſt be equal to each other; for the vibrations of the ſtring are known to be ſo.

Again, as to the velocity with which ſounds travel, this Newton determines, by the moſt difficult calculation that can be imagined, to be in proportion to the thickneſs of the parts of the air, and the diſtance of theſe parts from each other. From hence he goes on to prove, that each little part moves backward and forward like a pendulum; and from thence he proceeds to demonſtrate, that if the atmoſphere were of the ſame denſity every where as at the ſurface of the earth; in ſuch a caſe, a pendulum that reached from its higheſt ſurface down to the ſurface of the earth, would by its vibrations diſcover to us the proportion of its velocity with which ſounds travel. The velocity with which each pulſe would move, he ſhows, would be as much greater than the velocity of ſuch a pendulum ſwinging with one complete vibration, as the circumference of a circle is greater than the diameter. From hence he calculates, that the motion of ſound will be 979 feet in one ſecond. But this not being conſonant to experience he takes in another conſideration, which deſtroys entirely the vigour of his former demonſtration, namely, vapours in the air; and then finds the motion of ſound to be 1142 feet in one ſecond, or near 13 miles in a minute: a proportion which experience had eſtabliſhed nearly before.

7 Preceding Theory oppoſed.

Thus much will ſerve to give an obſcure idea of a theory which has met with numbers of oppoſers. Even John Bernouilli, Newton's greateſt diſciple, modeſtly owns that he did not pretend to underſtand this part of the *Principia*. He attempted therefore to give a more perſpicuous demonſtration of his own, that might confirm and illuſtrate the Newtonian theory. The ſubject ſeemed to reject elucidation; his theory is obviouſly wrong, as D'Alembert has proved in his Theory of Fluids.

8 The objections.

Various have been the objections that have been made to the Newtonian ſyſtem of ſounds. It is urged, that this theory can only agree with the motion of ſound in an elaſtic fluid, whereas ſounds are known to move forward through water that is not elaſtic. To explain their progreſs therefore through water, a ſecond theory muſt be formed: ſo that two theories muſt be made to explain a ſimilar effect; which is contrary to the ſimplicity of true philoſophy, for it is contrary to the ſimplicity of nature. It is farther urged, that this ſlow vermicular motion but ill repreſents the velocity with which ſounds travel, as we know by experience that it is almoſt 13 miles in a minute. In ſhort, it is urged, that ſuch undulations as have been deſcribed, when coming from ſeveral ſonorous bodies at once, would croſs, obſtruct, and confound each other; ſo that, if they were conveyed to the ear by this means, we ſhould hear nothing but a medley of diſcord and broken articulations. But this is equally with the reſt contradictory to experience, ſince we hear the fulleſt concert, not only without confuſion, but with the higheſt pleaſure. Theſe objections, whether well founded or not, have given riſe to another theory: which we ſhall likewiſe lay before the reader: though it too appears liable to objections, which ſhall be afterwards mentioned.

9 Another Theory.

Every ſound may be conſidered as driven off from the ſounding body in ſtraight lines, and impreſſed upon the air in one direction only: but whatever impreſſion is made upon a fluid in one direction, is diffuſed upon its ſurface in all directions; ſo that the ſound firſt driven directly forward ſoon fills up a wide ſphere, and is heard on every ſide. Thus, as it is impreſſed, it inſtantaneouſly travels forward with a very ſwift motion, reſembling the velocity with which we know electricity flies from one end of a line to another.

Now, as to the pulſes, or cloſe ſhakes, as the muſicians expreſs it, which a ſounding body is known to make

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make, each pulſe (ſay the ſupporters of this theory) is itſelf a diſtinct and perfect ſound, and the interval between every two pulſes is profoundly ſilent. Continuity of ſound from the ſame body is only a deception of the hearing; for as each diſtinct ſound ſucceeds at very ſmall intervals, the organ has no time to tranſmit its images with equal ſwiftneſs to the mind, and the interval is thus loſt to ſenſe; juſt as in ſeeing a flaming torch, if flared round in a circle, it appears as a ring of fire. In this manner a beaten drum, at ſome ſmall diſtance, preſents us with the idea of continuing ſound. When children run with their ſticks along a rail, a continuing ſound is thus repreſented, though it need ſcarce be obſerved that the ſtroke againſt each rail is perfectly diſtinct and inſulated.

According to this theory, therefore, the pulſes are nothing more than diſtinct ſounds repeated by the ſame body, the firſt ſtroke or vibration being ever the loudeſt, and travelling farther than thoſe that follow; while each ſucceding vibration gives a new ſound, but with diminiſhed force, till at laſt the pulſes decay away totally, as the force decays that gives them exiſtence.

All bodies whatſoever that are ſtruck return more or leſs a ſound: but ſome, wanting elaſticity, give back no repetition of the ſound; the noiſe is at once begotten and dies: while other bodies, however, there are, which being more elaſtic and capable of vibration, give back a ſound, and repeat the ſame ſeveral times ſucceſſively. Theſe laſt are ſaid to have a tone; the others are not allowed to have any.

This tone of the elaſtic ſtring, or bell, is notwithſtanding nothing more than a ſimilar ſound of what the former bodies produced, but with the difference of being many times repeated while their note is but ſingle. So that, if we would give the former bodies a tone, it will be neceſſary to make them repeat their ſound, by repeating our blows ſwiftly upon them. This will effectually give them a tone; and even an unmuſical inſtrument has often had a fine effect by its tone in our concerts.

Let us now go on then to ſuppoſe, that by ſwift and equably continued ſtrokes we give any non-elaſtic body its tone: it is very obvious, that no alterations will be made in this tone by the quickneſs of the ſtrokes, though repeated ever ſo faſt. Theſe will only render the tone more equal and continuous, but make no alteration in the tone it gives. On the contrary, if we make an alteration in the force of each blow, a different tone will then undoubtedly be excited. The difference will be ſmall, it muſt be confeſſed; for the tones of theſe inflexible bodies are capable but of ſmall variation; however, there will certainly be a difference. The table on which we write, for inſtance, will return a different ſound when ſtruck with a club, from what it did when ſtruck only with a ſwitch. Thus non-elaſtic bodies return a difference of tone, not in proportion to the ſwiftneſs with which their ſound is repeated, but in proportion to the greatneſs of the blow which produced it; for in two equal non-elaſtic bodies, that body produced the deepeſt tone which was ſtruck by the greateſt blow.

We now then come to a critical queſtion, What is it that produces the difference of tone in two elaſtic ſounding bells or ſtrings? Or what makes one deep and the other ſhrill? This queſtion has always been hitherto anſwered by ſaying, that the depth or height of the note proceeded from the ſlowneſs or ſwiftneſs of the times of the vibrations. The ſloweſt vibrations, it has been ſaid, are qualified for producing the deepeſt tones, while the ſwifteſt vibrations produce the higheſt tones. In this caſe, an effect has been given for a cauſe. It is in fact the force with which the ſounding ſtring ſtrikes the air when ſtruck upon, that makes the true diſtinction in the tones of ſounds. It is this force, with greater or leſs impreſſions, reſembling the greater or leſs force of the blows upon a non-elaſtic body, which produces correſpondent affections of ſound. The greateſt forces produce the deepeſt ſounds: the high notes are the effect of ſmall efforts. In the ſame manner a bell, wide at the mouth, gives a grave ſound; but if it be very maſſy withal, that will render it ſtill graver; but if maſſy, wide, and long or high, that will make the tone deepeſt of all.

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Thus, then, will elaſtic bodies give the deepeſt ſound, in proportion to the force with which they ſtrike the air: but if we ſhould attempt to increaſe their force by giving them a ſtronger blow, this will be in vain; they will ſtill return the ſame tone; for ſuch is their formation, that they are ſonorous only becauſe they are elaſtic, and the force of this elaſticity is not increaſed by our ſtrength, as the greatneſs of a pendulum's vibration will not be increaſed by falling from a greater height.

Thus far of the length of chords. Now as to the frequency with which they vibrate the deepeſt tones, it has been found, from the nature of elaſtic ſtrings, that the longeſt ſtrings have the wideſt vibrations, and conſequently go backward and forward ſloweſt; while, on the contrary, the ſhorteſt ſtrings vibrate the quickeſt, or come and go in the ſhorteſt intervals. From hence thoſe who have treated of ſounds, have aſſerted, as was ſaid before, that the tone of the ſtring depended upon the length or the ſhortneſs of the vibrations. This, however, is not the caſe. One and the ſame ſtring, when ſtruck, muſt always, like the ſame pendulum, return preciſely ſimilar vibrations; but it is well known, that one and the ſame ſtring, when ſtruck upon, does not always return preciſely the ſame tone: ſo that in this caſe the vibrations follow one rule, and the tone another. The vibrations muſt be invariably the ſame in the ſame ſtring, which does not return the ſame tone invariably, as is well known to muſicians in general. In the violin, for inſtance, they can eaſily alter the tone of the ſtring an octave or eight notes higher, by a ſofter method of drawing the bow; and ſome are known thus to bring out the moſt charming airs imaginable. Theſe peculiar tones are by the Engliſh fiddlers called *flute-notes*. The only reaſon, it has been alledged, that can be aſſigned for the ſame ſtring thus returning different tones, muſt certainly be the different force of its ſtrokes upon the air. In one caſe, it has double the tone of the other; becauſe upon the ſoft touches of the bow, only half its elaſticity is put into vibration.

This being underſtood (continue the authors of this theory), we ſhall be able clearly to account for many things relating to ſounds that have hitherto been inexplicable. Thus, for inſtance, if it be aſked, When two ſtrings are ſtretched together of equal lengths, tenſions, and thickneſs, how does it happen, that one of them being ſtruck, and made to vibrate throughout, the other ſhall vibrate throughout alſo? the anſwer is obvious: The force that the ſtring ſtruck receives is communicated to the air, and the air communicates the ſame to the ſimilar ſtring; which therefore receives all the force of the former; and the force being equal, the vibrations muſt be ſo too. Again, put the queſtion, If one ſtring be but half the length of the other, and be ſtruck, how will the vibrations be? The anſwer is, The longeſt ſtring will receive all the force of the ſtring half as long as itſelf, and therefore it will vibrate in proportion, that is, through half its length. In the ſame manner, if the longeſt ſtring were three times as long as the other, it would only vibrate in a third of its length; or if four times, in a fourth of its length. In ſhort, whatever force the ſmaller ſtring impreſſes upon the air, the air will impreſs a ſimilar force upon the longer ſtring, and partially excite its vibrations.

10
Eolian Lyre, See Plate I. fig. 2

From hence alſo we may account for the cauſe of thoſe charming, melancholy gradations of ſound in the Eolian lyre; an inſtrument (ſays Sir John Hawkins) lately obtruded upon the public as a new invention, though deſcribed above a century ago by Kircher *. This inſtrument is eaſily made, being nothing more than a long narrow box of thin dale, about 30 inches long, 5 inches broad, and 1¾ inches deep, with a circle in the middle of the upper ſide or belly about 1½ inch diameter, pierced with ſmall holes. On this ſide are ſeven, ten, or (according to Kircher) fifteen or more ſtrings of very fine gut, ſtretched over bridges at each end, like the bridge of a fiddle, and ſcrewed up or relaxed with ſcrew-pins (B). The ſtrings are all tuned to one and the ſame note; and the inſtrument is placed in ſome current of air, where the wind can bruſh over its ſtrings with freedom. A window with the ſaſh juſt raiſed to give the air admiſſion, will anſwer this purpoſe exactly. Now when the entering air blows upon theſe ſtrings with different degrees of force, there will be excited different tones of ſound; ſometimes the blaſt brings out all the tones in full concert; ſometimes it ſinks them to the ſofteſt murmurs; it feels for every tone, and by its gradations of ſtrength ſolicits thoſe gradations of ſound which art has taken different methods to produce.

* *Vide* Kircheri Muſurgia, lib. ix.

It remains in the laſt place, to conſider (by this theory) the loudneſs and lowneſs, or, as the muſicians ſpeak, the ſtrength and ſoftneſs of ſound. In vibrating elaſtic ſtrings, the loudneſs of the tone is in proportion to the deepneſs of the note; that is, in two ſtrings, all things in other circumſtances alike, the deepeſt tone will be loudeſt. In muſical inſtruments upon a different principle, as in the violin, it is otherwiſe; the tones are made in ſuch inſtruments, by a number of ſmall vibrations crowded into one ſtroke. The roſined bow, for inſtance, being drawn along a ſtring, its roughneſſes catch the ſtring at very ſmall intervals, and excite its vibrations. In this inſtrument, therefore, to excite loud tones, the bow muſt be drawn quick, and this will produce the greateſt number of vibrations. But it muſt be obſerved, that the more quick the bow paſſes over the ſtring, the leſs apt will the roughneſs of its ſurface be to touch the ſtring at every inſtant; to remedy this, therefore, the bow muſt be preſſed the harder as it is drawn quicker, and thus its fulleſt ſound will be brought from the inſtrument. If the ſwiftneſs of the vibrations in an inſtrument thus rubbed upon, exceed the force of the deeper ſound in another, then the ſwift vibrations will be heard at a greater diſtance, and as much farther off as the ſwiftneſs in them exceeds the force in the other.

11
The nature of Muſical Sounds illuſtrated according to the ſame theory.

By the ſame theory (it is alledged) may all the phenomena of muſical ſounds be eaſily explained.—The fables of the ancients pretend, that muſic was firſt found out by the beating of different hammers upon the ſmith's anvil. Without purſuing the fable, let us endeavour to explain the nature of muſical ſounds by a ſimilar method. Let us ſuppoſe an anvil, or ſeveral ſimilar anvils, to be ſtruck upon by ſeveral hammers of different weights or forces. The hammer, which is double that of another, upon ſtriking the anvil will produce a ſound double that of the other; this double ſound muſicians have agreed to call an Octave. The ear can judge of the difference or reſemblance of theſe ſounds with great eaſe, the numbers being as one and two, and therefore very readily compared. Suppoſe that an hammer, three times leſs than the firſt, ſtrikes the anvil, the ſound produced by this will be three times leſs than the firſt: ſo that the ear, in judging the ſimilitude of theſe ſounds, will find ſomewhat more difficulty; becauſe it is not ſo eaſy to tell how often one is contained in three, as it is to tell how often it is contained in two. Again, ſuppoſe that an hammer four times leſs than the firſt ſtrikes the anvil, the ear will find greater difficulty ſtill in judging preciſely the difference of the ſounds; for the difference of the numbers four and one cannot ſo ſoon be determined with preciſion as three and one. If the hammer be five times leſs, the difficulty of judging will be ſtill greater. If the hammer be ſix times leſs, the difficulty ſtill increaſes, and ſo alſo of the ſeventh, inſomuch that the ear cannot always readily and at once determine the preciſe gradation. Now, of all compariſons, thoſe which the mind makes moſt eaſily, and with leaſt labour, are the moſt pleaſing. There is a certain regularity in the human ſoul, by which it finds happineſs in exact and ſtriking, and eaſily made compariſons. As the ear is but an inſtrument of the mind, it is therefore moſt pleaſed with the combination of any two ſounds, the differences of which it can moſt readily diſtinguiſh. It is more pleaſed with the concord of two ſounds which are to each other as one and two, than of two ſounds which are as one and three, or one and four, or one and five, or one and ſix or ſeven. Upon this pleaſure, which the mind takes in compariſon, all harmony depends. The variety of ſounds is infinite; but becauſe the ear cannot compare two ſounds ſo as readily to diſtinguiſh their diſcriminations when they exceed the proportion of one and ſeven, muſicians have been content to confine all harmony within that compaſs, and allowed but ſeven notes in muſical compoſition.

Let us now then ſuppoſe a ſtringed inſtrument fitted up

(B) The figure repreſents the inſtrument with ten chords: of which ſome direct only eight to be tuned uniſons, and the two outermoſt octaves below them. But this ſeems not to be material.

up in the order mentioned above. For inſtance: Let the firſt ſtring be twice as long as the ſecond; let the third ſtring be three times ſhorter than the firſt; let the fourth be four times, the fifth ſtring five times, and the ſixth ſix times as ſhort as the firſt. Such an inſtrument would probably give us a repreſentation of the lyre as it came firſt from the hand of the inventor. This inſtrument will give us all the ſeven notes following each other, in the order in which any two of them will accord together moſt pleaſingly; but yet it will be a very inconvenient and a very diſagreeable inſtrument: inconvenient, for in a compaſs of ſeven ſtrings only, the firſt muſt be ſeven times as long as the laſt; and diſagreeable, becauſe this firſt ſtring will be ſeven times as loud alſo; ſo that when the tones are to be played in a different order, loud and ſoft ſounds would be intermixed with moſt diſguſting alternations. In order to improve the firſt inſtrument, therefore, ſucceeding muſicians very judiciouſly threw in all the other ſtrings between the two firſt, or, in other words, between the two Octaves, giving to each, however, the ſame proportion to what it would have had in the firſt natural inſtrument. This made the inſtrument more portable, and the ſounds more even and pleaſing. They therefore diſpoſed the ſounds between the Octave in their natural order, and gave each its own proportional dimenſions. Of theſe ſounds, where the proportion between any two of them is moſt obvious, the concord between them will be moſt pleaſing. Thus Octaves, which are as two to one, have a moſt harmonious effect; the fourth and fifth alſo ſound ſweetly together, and they will be found, upon calculation, to bear the ſame proportion to each other that Octaves do. "Let it "not be ſuppoſed (ſays Mr Saveur), that the muſical "ſcale is merely an arbitrary combination of ſounds; "it is made up from the conſonance and differences of "the part which compoſe it. Thoſe who have often "heard a fourth and fifth accord together, will be "naturally led to diſcover their difference at once; and "the mind unites itſelf to their beauties." Let us then ceaſe to aſſign the coincidences of vibrations as the cauſe of harmony, ſince theſe coincidences in two ſtrings vibrating at different intervals, muſt at beſt be but fortuitous; whereas concord is always pleaſing. The true cauſe why concord is pleaſing, muſt ariſe from our power, in ſuch a caſe, of meaſuring more eaſily the differences of the tones. In proportion as the note can be meaſured with its fundamental tone by large and obvious diſtinctions, then the concord is moſt pleaſing; on the contrary, when the ear meaſures the diſcriminations of two tones by very ſmall parts, or cannot meaſure them at all, it loſes the beauty of their reſemblance: the whole is diſcord and pain (c).

But there is another property in the vibration of a muſical ſtring not yet taken notice of, and which is alleged to confirm the foregoing theory. If we ſtrike the ſtring of an harpſichord, or any other elaſtic ſounding chord whatever, it returns a continuing ſound. This, till of late, was conſidered as one ſimple uniform tone; but all muſicians now confeſs, that inſtead of one tone it actually returns four tones, and that conſtantly. The notes are, beſide the fundamental tone, an octave above, a twelfth above, and a ſeventeenth. One of the baſs-notes of an harpſichord has been diſſected in this manner by Rameau, and the actual exiſtence of theſe tones proved beyond a poſſibility of being controverted. In fact, the experiment is eaſily tried; for if we ſmartly ſtrike one of the lower keys of an harpſichord, and then take the finger briſkly away, a tolerable ear will be able to diſtinguiſh, that, after the fundamental tone has ceaſed, three other ſhriller tones will be diſtinctly heard; firſt the octave above, then the twelfth, and laſtly the ſeventeenth: the octave above is in general almoſt mixed with the fundamental tone, ſo as not to be eaſily perceived, except by an ear long habituated to the minute diſcriminations of ſounds. So that we may obſerve, that the ſmalleſt tone is heard laſt, and the deepeſt and largeſt one firſt: the two others in order.

In the whole theory of ſounds, nothing has given greater room for ſpeculation, conjecture, and diſappointment, than this amazing property in elaſtic ſtrings. The whole ſtring is univerſally acknowledged to be in vibration in all its parts, yet this ſingle vibration returns no leſs than four different ſounds. They who account for the tones of ſtrings by the number of their vibrations, are here at the greateſt loſs. Daniel Bernouilli ſuppoſes, that a vibrating ſtring divides itſelf into a number of curves, each of which has a peculiar vibration; and though they all ſwing together in the common vibration, yet each vibrates within itſelf. This opinion, which was ſupported, as moſt geometrical ſpeculations are, with the parade of demonſtration, was only born ſoon after to die. Others have aſcribed this to an elaſtic difference in the parts of the air, each of which, at different intervals, thus received different impreſſions from the ſtring, in proportion to their elaſticity. This is abſurd. If we allow the difference of tone to proceed from the force, and not the frequency, of the vibrations, this difficulty will admit of an eaſy ſolution. Theſe ſounds, though they ſeem to exiſt together in the ſtring, actually follow each other in ſucceſſion: while the vibration has greateſt force, the fundamental tone is brought forward: the force of the vibration decaying, the octave is produced, but almoſt only inſtantaneouſly; to this ſucceeds, with diminiſhed force, the twelfth; and, laſtly, the ſeventeenth is heard to vibrate with great diſtinctneſs, while the three other tones are always ſilent. Theſe ſounds, thus excited, are all of them the harmonic tones, whoſe differences from the fundamental tone are, as was ſaid, ſtrong, and diſtinct. On the other hand, the diſcordant tones cannot be heard. Their differences being but very ſmall, they are overpowered, and in a manner drowned in the tones of ſuperior difference: yet not always neither; for Daniel Bernouilli has been able, from the ſame ſtroke, to make the ſame ſtring bring out its harmonic and its diſcordant tones alſo (d.) So that from hence we may juſtly infer, that every note whatſoever is

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(c) It is certain, that in proportion to the ſimplicity of relations in ſound, the ear is pleaſed with its combinations; but this is not to be admitted as the cauſe why muſicians have confined all harmony to an octave. Diſcriminated ſounds, whoſe vibrations either never coincide, or at leaſt very rarely, do not only ceaſe to pleaſe, but violently grate, the ear. Harmony and diſcord, therefore, are neither diſcriminated by the judgment of hearers, nor the inſtitution of muſicians, but by their own eſſential and immutable nature.

(d) Vid. Memoires de l'Academie de Berlin, 1753, p. 153.

is only a ſucceſſion of tones ; and that thoſe are moſt diſtinctly heard, whoſe differences are moſt eaſily perceivable.

12
Objections to the preceding theory.

To this theory, however, though it has a plauſible appearance, there are ſtrong and indeed inſuperable objections. The very fundamental principle of it is falſe. No body whatever, whether elaſtic or non-elaſtic, yields a graver ſound by being ſtruck with a larger inſtrument, unleſs either the ſounding body, or that part of it which emits the ſound, is enlarged. In this caſe, the largeſt bodies always return the graveſt ſounds.

In ſpeaking of elaſtic and non-elaſtic bodies in a muſical ſenſe, we are not to puſh the diſtinction ſo far as when we ſpeak of them philoſophically. A body is *muſically* elaſtic, all of whoſe parts are thrown into vibration, ſo as to emit a ſound when only part of their ſurface is ſtruck. Of this kind are bells, muſical ſtrings, and all bodies whatever that are conſiderably hollow.—Muſical non-elaſtics are ſuch bodies as emit a ſound only from that particular place which is ſtruck : thus, a table, a plate of iron nailed on wood, a bell ſunk in the earth, are all of them non-elaſtics in a muſical ſenſe, though not philoſophically ſo. When a ſolid body, ſuch as a log of wood, is ſtruck with a ſwitch, only, that part of it emits a ſound which comes in contact with the ſwitch ; the note is acute and loud, but would be no leſs ſo though the adjacent parts of the log were removed. If, inſtead of the ſwitch, a heavier or larger inſtrument is made uſe of, a larger portion of its ſurface then returns a ſound, and the note is conſequently more grave ; but it would not be ſo, if the large inſtrument ſtruck with a ſharp edge, or a ſurface only equal to that of the ſmall one.

In ſounds of this kind, where there is only a ſingle thwack, without any repetition, the immediate cauſe of the gravity or acuteneſs ſeems to be the quantity of air diſplaced by the ſounding body ; a large quantity of air diſplaced, produces a grave ſound, and a ſmaller quantity a more acute one, the force wherewith the air is diſplaced ſignifying very little.—What we here advance, is confirmed by ſome experiments made by Dr Prieſtley, concerning the *muſical tone* of electrical diſcharges. The paſſage being curious, and not very long, we ſhall here tranſcribe it :

" As the courſe of my experiments has required a great variety of electrical exploſions, I could not help obſerving a great variety in the muſical tone made by the reports. This excited my curioſity to attempt to reduce this variation to ſome meaſure. Accordingly, by the help of a couple of ſpinets, and two perſons who had good ears for muſic, I endeavoured to aſcertain the tone of ſome electrical diſcharges ; and obſerved, that every diſcharge made ſeveral ſtrings, particularly thoſe that were chords to one another, to vibrate : but one note was always predominant, and ſounded after the reſt. As every exploſion was repeated ſeveral times, and three of us ſeparately took the ſame note, there remained no doubt but that the tone we fixed upon was at leaſt very near the true one. The reſult was as follows :

" A jar containing half a ſquare foot of coated glaſs ſounded F ſharp, concert pitch. Another jar of a different form, but equal ſurface, ſounded the ſame.

" A jar of three ſquare feet ſounded C below F ſharp. A battery conſiſting of ſixty-four jars, each containing half a ſquare foot, ſounded F below the C.

" The ſame battery, in conjunction with another of thirty-one jars, ſounded C ſharp. So that a greater quantity of coated glaſs always gave a deeper note.

" Differences in the degree of a charge in the ſame jar made little or no difference in the tone of the exploſion : if any, a higher charge gave rather a deeper note."

Theſe experiments ſhow us how much the gravity or acuteneſs of ſounds depend on the quantity of air put in agitation by the ſounding body. We know that the noiſe of the electric exploſion ariſes from the return of the air into the vacuum produced by the electric flaſh. The larger the vacuum, the deeper was the note : for the ſame reaſon, the diſcharge of a muſket produces a more acute note than that of a cannon ; and thunder is deeper than either.

Beſides this, however, other circumſtances concur to produce different degrees of gravity or acuteneſs in ſounds. The ſound of a table ſtruck upon with a piece of wood, will not be the ſame with that produced from a plate of iron ſtruck by the ſame piece of wood, even if the blows ſhould be exactly equal, and the iron perfectly kept from vibrating.—Here the ſounds are generally ſaid to differ in their degrees of acuteneſs, according to the ſpecific gravities or denſities of the ſubſtances which emit them. Thus gold, which is the moſt denſe of all metals, returns a much graver ſound than ſilver ; and metalline wires, which are more denſe than therms, return a proportionably greater ſound.—But neither does this appear to be a general rule in which we can put confidence. Bell-metal is denſer than copper, but it by no means appears to yield a graver ſound ; on the contrary, it ſeems very probable, that copper will give a graver ſound than bell-metal, if both are ſtruck upon in their non-elaſtic ſtate : and we can by no means think that a bell of pure tin, the leaſt denſe of all the metals, will give a more acute ſound than one of bell-metal, which is greatly more denſe.—In ſome bodies hardneſs ſeems to have a conſiderable effect. Glaſs, which is conſiderably harder than any metal, gives a more acute ſound ; bell-metal is harder than gold, lead, or tin, and therefore ſounds much more acutely ; though how far this holds with regard to different ſubſtances, there are not a ſufficient number of experiments for us to judge.

In bodies muſically elaſtic, the whole ſubſtance vibrates with the ſlighteſt ſtroke, and therefore they always give the ſame note whether they are ſtruck with a large or with a ſmall inſtrument ; ſo that ſtriking a part of the ſurface of any body muſically elaſtic is equivalent, in it, to ſtriking the whole ſurface of a non-elaſtic one. If the whole ſurface of a table was ſtruck with another table, the note produced would be neither more nor leſs acute whatever force was employed ; becauſe the whole ſurface would then yield a ſound, and no force could increaſe the ſurface : the ſound would indeed be louder in proportion to the force employed, but the gravity would remain the ſame. In like manner, when a bell, or muſical ſtring, is ſtruck, the whole ſubſtance vibrates, and a greater ſtroke cannot increaſe the ſubſtance.—Hence we ſee the fallacy of what is ſaid concerning the Pythagorean anvils. An anvil is a body muſically elaſtic, and no difference in the tone can be perceived whether it is ſtruck with a large, or with a ſmall hammer; becauſe either of them are ſufficient to make the whole ſubſtance vibrate, provided nothing but the anvil is ſtruck upon: ſmiths, however, do not ſtrike their anvils, but red-hot iron laid upon their anvils; and thus the vibrations of the anvil are ſtopped, ſo that it becomes a non-elaſtic body, and the differences of tone in the ſtrokes of different hammers proceed only from the ſurface of the large hammers covering the whole ſurface of the iron, or at leaſt a greater part of it than the ſmall ones. If the ſmall hammer is ſufficient to cover the whole ſurface of the iron as well as the large one, the note produced will be the ſame, whether the large or the ſmall hammer is uſed.

Laſtly, The argument for the preceding theory, grounded on the production of what are called *flute-notes* on the violin, is built on a falſe foundation; for the bow being lightly drawn on an open ſtring, produces no *flute-notes*, but only the harmonics of the note to which the ſtring is turned. The *flute-notes* are produced by a particular motion of the bow, quick and near the bridge, and by fingering very gently. By this management, the ſame ſounds are produced, tho' at certain intervals only, as if the vibrations were transferred to the ſpace between the end of the finger-board and the finger, inſtead of that between the finger and the bridge. Why this ſmall part of the ſtring ſhould vibrate in ſuch a caſe, and not that which is under the immediate action of the bow, we muſt own ourſelves ignorant: nor dare we affirm that the vibrations really are transferred in this manner, only the ſame ſounds are produced as if they were.

Though theſe objections ſeem ſufficiently to overturn the foregoing theory, with regard to acute ſounds being the effects of weak ſtrokes, and grave ones of ſtronger impulſes, we cannot admit that longer or ſhorter vibrations are the occaſion of gravity or acuteneſs in ſound. A muſical ſound, however lengthened, either by ſtring or bell, is only a repetition of a ſingle one, whoſe duration by itſelf is but for a moment, and is therefore termed *inappretiable*, like the ſmack of a whip, or the exploſion of an electrical battery. The continuation of the ſound is nothing more than a repetition of this inſtantaneous inappretiable noiſe after the manner of an echo, and it is only this echo that makes the ſound agreeable. For this reaſon, muſic is much more agreeable when played in a large hall where the ſound is reverberated, than in a ſmall room where there is no ſuch reverberation. For the ſame reaſon, the ſound of a ſtring is more agreeable when put on a hollow violin, than when faſtened to a plain board, &c.—In the ſound of a bell, we cannot avoid obſerving this echo very diſtinctly. The ſound appears to be made up of diſtinct pulſes, or repetitions of the ſame note produced by the ſtroke of the hammer. It can by no means be allowed, that the note would be more acute though theſe pulſes were to ſucceed one another more rapidly; the ſound would indeed become more ſimple, but would ſtill preſerve the ſame tone.—In muſical ſtrings, the reverberations are vaſtly more quick than in bells; and therefore their ſound is more uniform or ſimple, and conſequently more agreeable than that of bells. In muſical glaſſes,* the vibrations muſt be inconceivably quicker than in any bell, or ſtringed inſtrument: and hence they are of all others the moſt ſimple and the moſt agreeable, though neither the moſt acute nor the loudeſt.—As far as we can judge, quickneſs of vibration contributes to the uniformity, or ſimplicity, but not to the acuteneſs, nor to the loudneſs, of a muſical note.

It may here be objected, that each of the different pulſes, of which we obſerve the ſound of a bell to be compoſed, is of a very perceptible length, and far from being inſtantaneous; ſo that it is not fair to infer that the ſound of a bell is only a repetition of a ſingle inſtantaneous ſtroke, ſeeing it is evidently the repetition of a lengthened note.—To this it may be replied, that the inappretiable ſound which is produced by ſtriking a bell in a non-elaſtic ſtate, is the very ſame which, being firſt propagated round the bell, forms one of theſe ſhort pulſes that is afterwards re-echoed as long as the vibrations of the metal continue, and it is impoſſible that the quickneſs of repetition of any ſound can either increaſe or diminiſh its gravity.

CHAP. II. *Of the Propagation of Sound. Newton's Doctrine explained and vindicated.*

13 Propagation of ſound.

THE writers on ſound have been betrayed into theſe difficulties and obſcurities, by rejecting the 47th propoſition, B. ii. of Newton, as inconcluſive reaſoning.—Of this propoſition, however, the ingenious Mr Young of Trinity College, Dublin, has lately given a clear, explanatory, and able defence. He candidly owns that the demonſtration is obſcurely ſtated, and takes the liberty of varying, in ſome degree, from the method of Newton.

“ 1. The parts of all ſounding bodies (he obſerves) vibrate according to the law of a cycloidal pendulum: for they may be conſidered as compoſed of an indefinite number of elaſtic fibres; but theſe fibres vibrate according to that law. *Vide Helſham*, p. 270.

“ 2. Sounding bodies propagate their motions on all ſides *in directum*, by ſucceſſive condenſations and rarefactions, and ſucceſſive goings forward and returnings backward of the particles. *Vide prop.* 43. *B.* 2. *Newton.*

“ 3. The pulſes are thoſe parts of the air which vibrate backwards and forwards; and which, by going forward, ſtrike (*pulſant*) againſt obſtacles. The latitude of a pulſe is the rectilineal ſpace through which the motion of the air is propagated during one vibration of the ſounding body.

“ 4. All pulſes move equally faſt. This is proved by experiment; and it is found that they deſcribe 1070 Paris feet, or 1142 London feet, in a ſecond, whether the ſound be loud or low, grave or acute.

“ 5. Prob. To determine the latitude of a pulſe. Divide the ſpace which the pulſe deſcribes in a given time (4) by the number of vibrations performed in the ſame time by the ſounding body (*cor.* 1. *prop.* 24. *Smith's Harmonics*) the quotient is the latitude.

“ M. Sauveur, by ſome experiments on organ-pipes, found that a body, which gives the graveſt harmonic ſound, vibrates 12 times and a half in a ſecond, and that the ſhrilleſt ſounding body vibrates 51.100 times in a ſecond. At a medium, let us take the body which gives what Sauveur calls his *fixed ſound*: it performs 100 vibrations in a ſecond, and in the ſame time the pulſes deſcribe 1070 Pariſian feet; therefore the ſpace deſcribed by the pulſes whilſt the body vibrates once, that

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* See *Harmonics*.

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that is, the latitude or interval of the pulſe, will be 10.7 feet.

" 6. Prob. To find the proportion which the greateſt ſpace, through which the particles of the air vibrate, bears to the radius of a circle, whoſe perimeter is equal to the latitude of the pulſe.

" During the firſt half of the progreſs of the elaſtic fibre, or ſounding body, it is continually getting nearer to the next particle; and during the latter half of its progreſs, that particle is getting farther from the fibre, and theſe portions of time are equal (*Helſham*); therefore we may conclude, that at the end of the progreſs of the fibre, the firſt particle of air will be nearly as far diſtant from the fibre as when it began to move; and in the ſame manner we may infer, that all the particles vibrate through ſpaces nearly equal to that run over by the fibre.

" Now, M.Sauveur (*Acad. Science, an.* 1700, *p.* 141) has found by experiment, that the middle point of a chord which produces his *fixed ſound*, and whoſe diameter is $\frac{1}{6}$th of a line, runs over in its ſmalleſt ſenſible vibrations $\frac{1}{18}$th of a line, and in its greateſt vibrations 72 times that ſpace; that is $72\times\frac{1}{18}$ of a line, or 4 lines, that is, $\frac{1}{3}$ of an inch.

" The latitude of the pulſes of this fixed ſound is 10.7 feet (5); and ſince the circumference of a circle is to its radius as 710 is to 113, the greateſt ſpace deſcribed by the particles will be to the radius of a circle, whoſe periphery is equal to the latitude of the pulſe as $\frac{1}{3}$d of an inch is to 1.7029 feet, or 20.4348 inches, that is, as 1 to 61.3044.

" If the length of the ſtring be increaſed or diminiſhed in any proportion, *cæteris paribus*, the greateſt ſpace deſcribed by its middle point will vary in the ſame proportion. For the inflecting force is to the tending force as the diſtance of the ſtring from the middle point of vibration to half the length of the ſtring (*ſee Helſham and Martin*); and therefore the inflecting and tending forces being given, the ſtring will vibrate through ſpaces proportional to its length; but the latitude of the pulſe is univerſally as the number of vibrations performed by the ſtring in a given time, (5) that is, directly as the time of one vibration, or directly as the length of the ſtring (*prop.* 24. *cor.* 7. *Smith's Harmonics*); therefore the greateſt ſpace through which the middle point of the ſtring vibrates, will vary in the direct ratio of the latitude of the pulſe, or of the radius of a circle whoſe circumference is equal to the latitude, that is, it will be to that radius as 1 to 61.3044.

" 7. If the particles of the aërial pulſes, during any part of their vibration, be ſucceſſively agitated, according to the law of a cycloidal pendulum, the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards be agitated, will be ſuch as will cauſe the particles to continue that motion, according to the ſame law, to the end of their vibration.

Plate I. fig. 7.

" Let AB, BC, CD, &c. denote the equal diſtances of the ſucceſſive pulſes; ABC the direction of the motion of the pulſes propagated from A towards B; E, F, G, three phyſical points of the quieſcent medium, ſituated in the right line AC at equal diſtances from each other; E*e*, F*f*, G*g* the very ſmall equal ſpaces through which theſe particles vibrate; ε, φ, γ any immediate places of theſe points. Draw the right line PS equal to E*e*, biſect it in O, and from the centre O with the radius O P deſcribe the circle SIP*h*. Let the whole time of the vibration of a particle and its parts be denoted by the circumference of this circle and its proportional parts. And ſince the particles are ſuppoſed to be at firſt agitated according to the law of a cycloidal pendulum, if at any time PH, or PHS*h*, the perpendicular HL or *hl*, be let fall on PS, and if Eε be taken equal to PL or P*l*, the particle E ſhall be found in ε. Thus will the particle E perform its vibrations according to the law of a cycloidal pendulum. *Prop.* 52. *B.* 1. *Principia.*

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" Let us ſuppoſe now, that the particles have been ſucceſſively agitated, according to this law, for a certain time, by any cauſe whatſoever, and let us examine what will be the comparative elaſtic forces ariſing from their mutual action, by which they will afterwards continue to be agitated.

" In the circumference PHS*h* take the equal arches HI, IK in the ſame ratio to the whole circumference which the equal right lines EF, FG have to BC the whole interval of the pulſes; and let fall the perpendiculars HL, IM, KN. Since the points E, F, G are ſucceſſively agitated in the ſame manner, and perform their entire vibrations of progreſs and regreſs while the pulſe is propagated from B to C, if PH be the time from the beginning of the motion of E, PI will be the time from the beginning of the motion of F, and PK the time from the beginning of the motion of G; and therefore Eε, Fφ, Gγ will be reſpectively equal to PL, PM, PN in the progreſs of the particles. Whence εφ or EF×Fφ—E, is equal to EF—LM. But εφ is the expanſion of EF in the place εφ, and therefore this expanſion is to its mean expanſion as EF—LM to EF. But LM is to IH as IM is to OP, and IH is to EF as the circumference PHS*h* is to BC; that is, as OP is to V, if V be the radius of a circle whoſe circumference is BC; therefore, *ex æquo*, LM is to EF as IM is to V; and therefore the expanſion of EF in the place εφ is to its mean expanſion as V—IM is to V; and the elaſtic force exiſting between the phyſical points E and F is to the mean elaſtic force as $\frac{1}{V-IM}$ is to $\frac{1}{V}$ (*Cotes Pneum. Lect.* 9.) By the ſame argument, the elaſtic force exiſting between the phyſical points F and G is to the mean elaſtic force as $\frac{1}{V-KN}$ is to $\frac{1}{V}$; and the difference between theſe forces is to the mean elaſtic force as

$$\frac{IM-KN}{V^2-V.IM-V.KN+IM.KN} \text{ is to } \frac{1}{V}; \text{ that is, as}$$

$\frac{IM-KN}{V^2}$ is to $\frac{1}{V}$; or as IM—KN is to V; if only (upon account of the very narrow limits of the vibration) we ſuppoſe IM and KN to be indefinitely leſs than V. Wherefore, ſince V is given, the difference of the forces is as IM—KN, or as HL—IM (becauſe KH is biſected in I); that is, (becauſe HL—IM is to IH as OM is to OI or OP, and IH and OP are given quantities) as OM; that is, if F*f* be biſected in Ω as Ωφ.

" In the ſame manner it may be ſhown, that if PHS*h* be the time from the beginning of the motion of E, PHS*i* will be the time from the beginning of the motion of F, and PHS*k* the time from the beginning of the

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the motion of G; and that the expanſion of EF in the place $\epsilon\varphi$ is to its mean expanſion as $EF+F\varphi-E\epsilon$, or as $EF+lm$ is to EF, or as $V+hl$ is to V in its regreſs; and its elaſtic force to the mean elaſtic force as $\frac{1}{V+hl}$ is to $\frac{1}{V}$; and that the difference of the elaſtic forces exiſting between E and F, and between F and G is to the mean elaſtic force as $kn-im$ is to V; that is, directly as $\Omega\varphi$.

"But this difference of the elaſtic forces, exiſting between E and F, and between F and G, is the comparative elaſtic force by which the phyſical point φ is agitated: and therefore the comparative accelerating force, by which every phyſical point in the medium will continue to be agitated both in progreſs and regreſs, will be directly as its diſtance from the middle point of its vibration; and conſequently will be ſuch as will cauſe the particles to continue their motion, undiſturbed, according to the law of a cycloidal pendulum. *Prop.* 38. *l.* 1. *Newton.*

"Newton rejects the quantity $\mp V\times\overline{IM+KN}+IM\times KN$, on ſuppoſition that IM and KN are indefinitely leſs than V. Now, although this may be a reaſonable hypotheſis, yet, that this quantity may be ſafely rejected, will, I think, appear in a more ſatisfactory manner from the following conſiderations derived from experiment: PS, in its greateſt poſſible ſtate, is to V as 1 is to 61.3044 (6); and therefore IM or KN, in its greateſt poſſible ſtate, (that is, when the vibrations of the body are as great as poſſible, and the particle in the middle point of its vibration) is to V as 1 is to 122.6. Hence $V^2=15030.76$, $-V\times\overline{IM+KN}=245.2$ and $IM\times KN=1$; therefore V^2 is to $V^2-V\times\overline{IM+KN+IM\times KN}$ as 15.03076 is to 14.78656; that is as 61 is to 60 nearly.

"Hence it appears, that the greateſt poſſible error in the accelerating force, in the middle point, is the $\frac{1}{61}$ſt part of the whole. In other points it is much leſs; and in the extreme points the error entirely vaniſhes.

"We ſhould alſo obſerve, that the ordinary ſounds we hear are not produced by the greateſt poſſible vibrations of which the ſounding body is capable; and that in general IM and KN are nearly evaneſcent with reſpect to V. And very probably the diſagreeable ſenſations we feel in very loud ſounds, ariſe not only from IM or KN bearing a ſenſible proportion to V, by which means the cycloidal law of the pulſes may be in ſome meaſure diſturbed, but alſo from the very law of the motion of the ſounding body itſelf being diſturbed. For the proof of this law's being obſerved by an elaſtic fibre is founded on the hypotheſis that the ſpace, through which it vibrates, is indefinitely little with reſpect to the length of the ſtring. *See Smith's Harmonics, p.* 237, *Helſham, p.* 270.

"8. If a particle of the medium be agitated, according to the law of a cycloidal pendulum, the comparative elaſtic force, acting on the adjacent particle, from the inſtant in which it begins to move, will be ſuch as will cauſe it to continue its motion according to the ſame law.

"For let us ſuppoſe, that three particles of the medium had continued to move for times denoted by the arches PK, PI, PH, the comparative elaſtic force, acting on the ſecond during the time of its motion, would have been denoted by HL—IM, that is, would have been directly as MO (7). And if this time be diminiſhed till I becomes coincident with P. that is, if you take the particles in that ſtate when the ſecond is juſt beginning to move, and before the third particle has yet been ſet in motion; then the point M will fall on P, and MO become PO; that is, the comparative elaſtic force of the ſecond particle, at the inſtant in which it begins to move, will be to the force with which it is agitated in any other moment of time, before the ſubſequent particle has yet been ſet in motion, directly as its diſtance from the middle point of vibration. Now this comparative elaſtic force, with which the ſecond particle is agitated in the very moment in which it begins to move, ariſes from the preceding particle's approaching it according to the law of a pendulum; and therefore, if the preceding particle approaches it in this manner, the force by which it will be agitated, in the very moment it begins to move, will be exactly ſuch as ſhould take place in order to move it according to the law of a pendulum. It therefore ſets out according to that law, and conſequently the ſubſequent elaſtic forces, generated in every ſucceſſive moment, will alſo continue to be of the juſt magnitude which ſhould take place, in order to produce ſuch a motion.

"9. The pulſes of the air are propagated from ſounding bodies, according to the law of a cycloidal pendulum. The point E of any elaſtic fibre producing a ſound, may be conſidered as a particle of air vibrating according to the law of a pendulum (1). This point E will therefore move according to this law for a certain time, denoted by the arch IH, before the ſecond particle begins to move; for ſound is propagated in time through the ſucceſſive particles of air (4). Now from that inſtant, the comparative elaſtic force which agitates E, is (8) directly as its diſtance from the middle point of vibration. F therefore ſets out with a motion according to the law of a pendulum: and therefore the comparative elaſtic force by which it will be agitated until G begins to move, will continue that law (8). Conſequently F will approach G in the ſame manner as E approached F, and the comparative elaſtic force of G, from the inſtant in which it begins to move, will be directly as its diſtance from the middle point of vibration; and ſo on in ſucceſſion. Therefore all the particles of air in the pulſes ſucceſſively ſet out from their proper places according to the law of a pendulum, and therefore (7) will finiſh their entire vibrations according to the ſame law.

Plate I. fig. 7.

"*Cor.* 1. The number of pulſes propagated is the ſame with the number of vibrations of the tremulous body, nor is it multiplied in their progreſs: becauſe the little phyſical line $\epsilon\gamma$, (*fig.* 7.) as ſoon as it returns to its proper place, will there quieſce; for its velocity, which is denoted by the ſine IM, then vaniſhes, and its denſity becomes the ſame with that of the ambient medium. This line, therefore, will no longer move, unleſs it be again driven forwards by the impulſe of the ſounding body, or of the pulſes propagated from it.

"*Cor.* 2. In the extreme points of the little ſpace through which the particle vibrates, the expanſion of the air is in its natural ſtate; for the expanſion of the phyſical line is to its natural expanſion as $V\mp IM$ is to V; but IM is then equal to nothing. In the middle point of the progreſs the condenſation is greateſt; for IM is then greateſt, and conſequently the expanſion V—IM leaſt. In the middle of the regreſs, the rarefaction is greateſt; for *im*, and conſequently V+*im*, is then greateſt.

"10. To find the velocity of the pulſes, the denſity and elaſtic force of the medium being given.

"This is the 49th prop. B. ii. Newton, in which he ſhows, that whilſt a pendulum, whoſe length is equal to the height of the homogeneous atmoſphere, vibrates once forwards and backwards, the pulſes will deſcribe a ſpace equal to the periphery of a circle deſcribed with that altitude as its radius.

"*Cor.* 1. He thence ſhows, that the velocity of the pulſes is equal to that which a heavy body would acquire in falling down half the altitude of that homogeneous atmoſphere; and therefore, that all pulſes move equally faſt, whatever be the magnitude of PS, or the time of its being deſcribed; that is, whether the tone be loud or low, grave or acute. See *Hales de Sonis*, § 49.

"*Cor.* 2. And alſo, that the velocity of the pulſes is in a ratio compounded of the direct ſubduplicate ratio of the elaſtic force of the medium, and the inverſe ſubduplicate of its denſity. Hence ſounds move ſomewhat faſter in ſummer than in winter. See *Hales de Sonis*, p. 141.

"11. The ſtrength of a tone is as the moment of the particles of air. The moment of theſe particles, (the medium being given) is as their velocity; and the velocity of theſe particles is as the velocity of the ſtring which ſets them in motion (9). The velocities of two different ſtrings are equal when the ſpaces which they deſcribe in their vibrations are to each other as the times of theſe vibrations: therefore, two different tones are of equal ſtrength, when the ſpaces, through which the ſtrings producing them vibrate, are directly as the times of their vibration.

Plate III.

"12. Let the ſtrength of the tones of the two ſtrings AB, CD, which differ in tenſion only (fig. 1, 2.) be equal. Quere the ratio of the inflecting forces F and *f*. From the hypotheſis of the equality of the ſtrength of the tones, it follows (11), that the ſpace GE muſt be to the ſpace HF as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$, (*Smith's Harm. Prop.* 24. *Cor.* 4.) Now the forces inflecting AB, CD through the equal ſpaces GE, HP are to each other as the tending forces, that is, as F to *f*, (*Malcolm's Treatiſe on Muſic, p.* 52.) But the force inflecting CD through HP is to the force inflecting it through HF as HP or GE to HF, (*ib. p.* 47.) that is, by the hyp. as $f^{\frac{1}{2}}$ to $F^{\frac{1}{2}}$. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally ſtrong, are to each other as $F \times f^{\frac{1}{2}}$ to $f \times F^{\frac{1}{2}}$, or as $F^{\frac{1}{2}}$ to $f^{\frac{1}{2}}$. That is, the forces neceſſary to produce tones of equal ſtrength in various ſtrings which differ only in tenſion, are to each other in the ſubduplicate ratio of the tending forces, that is, inverſely as the time of one vibration, or directly as the number of vibrations performed in a given time. Thus, if CD be the acute octave to AB, its tending force will be quadruple that of AB, (*Malcolm's Treatiſe on Muſic, p.* 53); and therefore to produce tones of equal ſtrength in theſe ſtrings, the force impelling CD muſt be double that impelling AB; and ſo in other caſes.

"Suppoſe, now, that the ſtrings AB, CD, (fig. 2, 3.) differ in length only. The force inflecting AB through GE is to the tending force, which is given, as GE to AG; and this tending force is to the force inflecting CD through the ſpace HP equal to GE, as HD to HP. Therefore, *ex æquo*, the forces inflecting AB and CD through the equal ſpaces GE and HP, are to each other as HD to AG, or as CD to AB. But the force inflecting CD through HP is to the force inflecting it through HF, as HP or GE to HF, that is, becauſe theſe ſpaces are as the times (11), as AB to CD. Therefore, *ex æquo*, the forces inflecting AB and CD, when the tones are equally ſtrong, are to each other in a ratio of equality. Hence we ſhould ſuppoſe, that in this caſe, an equal number of equal impulſes would generate equally powerful tones in theſe ſtrings. But we are to obſerve, that the longer the ſtring, the greater *cæteris paribus*, is the ſpace through which a given force inflects it (*Malcolm*); and therefore whatever diminution is produced in the ſpaces through which the ſtrings move in their ſucceſſive vibrations, ariſing either from the want of perfect elaſticity in the ſtrings, or from the reſiſtance of the air, this diminution will bear a greater proportion to the leſs ſpace, through which the ſhorter ſtring vibrates. And this is confirmed by experience; for we find that the duration of the tone and motion of the whole ſtring exceeds that of any of its ſubordinate parts. Therefore, after a given interval of time, a greater quantity of motion will remain in the longer ſtring; and conſequently, after the ſucceſſive equal impulſes have been made, a greater degree of motion will ſtill ſubſiſt in it. That is, a given number of equal impulſes being made on various ſtrings differing in length only, a ſtronger ſound will be produced in that which is the longer."

Plate III.

Chap. III. *Of the Velocity*, &c. *of Sound. Axioms.*

14 Velocity of ſound.

Experience has taught us, that ſound travels at about the rate of 1142 feet in a ſecond, or near 13 miles in a minute; nor do any obſtacles hinder its progreſs, a contrary wind only a ſmall matter diminiſhing its velocity. The method of calculating its progreſs is eaſily made known. When a gun is diſcharged at a diſtance, we ſee the fire long before we hear the ſound. If then we know the diſtance of the place, and know the time of the interval between our firſt ſeeing the fire and then hearing the report, this will ſhow us exactly the time the ſound has been travelling to us. For inſtance, if the gun is diſcharged a mile off, the moment the flaſh is ſeen, you take a watch and count the ſeconds till you hear the ſound; the number of ſeconds is the time the ſound has been travelling a mile.—Again, by the above axiom, we are enabled to find the diſtance between objects that would be otherwiſe immeaſureable. For example, ſuppoſe you ſee the flaſh of a gun in the night at ſea, and tell ſeven ſeconds before you hear the report, it follows therefore, that the diſtance is ſeven times 1142 feet, that is, 24 yards more than a mile and a half. In like manner, if you obſerve the number of ſeconds between the lightning and the report of the thunder, you know the diſtance of the cloud from whence it proceeds.

15 Its progreſs calculated.

16 Diſtances calculated by means of ſound.

17 All ſounds travel at the ſame rate.

Derham has proved by experience, that all ſounds whatever travel at the ſame rate. The ſound of a gun, and the ſtriking of a hammer, are equally ſwift in their motions; the ſofteſt whiſper flies as ſwiftly, as far as it goes, as the loudeſt thunder.

To theſe axioms we may add the following.

18 Smooth and clear ſounds proceed from bodies that are homogeneous, and of an uniform figure; and harſh or obtuſe ſounds, from ſuch as are of a mixed matter and irregular figure.

19 The velocity of ſound is to that of a briſk wind as fifty to one.

20 The ſtrength of ſounds is greateſt in cold and denſe air, and leaſt in that which is warm and rarefied.

21 Every point againſt which the pulſes of ſound ſtrike, becomes a centre from which a new ſeries of pulſes are propagated in every direction.

22 Sound deſcribes equal ſpaces in equal times.

CHAP. IV. *Of Reverberated Sounds.*

23 SOUND, like light, after it has been reflected from ſeveral places, may be collected in one point, as into a focus; and it will be there more audible than in any other part, even than at the place from whence it proceeded. On this principle it is that a whiſpering gallery is conſtructed.

24 Whiſpering Gallery, Plate I. fig. 3. The form of this gallery muſt be that of a concave hemiſphere (E), as ABC; and if a low ſound or whiſper be uttered at A, the vibrations expanding themſelves every way will impinge on the points DDD, &c. and from thence be reflected to EEE, and from thence to the points F and G, till at laſt they all meet in C, where, as we have ſaid, the ſound will be the moſt diſtinctly heard.

25 Speaking-trumpet, fig. 4. The augmentation of ſound by means of ſpeaking-trumpets, is uſually illuſtrated in the following manner: Let ABC be the tube, BD the axis, and B the mouth-piece for conveying the voice to the tube. Then it is evident, when a perſon ſpeaks at B in the trumpet, the whole force of his voice is ſpent upon the air contained in the tube, which will be agitated through the whole length of the tube; and, by various reflections from the ſide of the tube to the axis, the air along the middle part of the tube will be greatly condenſed, and its *momentum* proportionably increaſed, ſo that when it comes to agitate the air at the orifice of the tube AC, its force will be as much greater than what it would have been without the tube, as the ſurface of a ſphere, whoſe radius is equal to the length of the tube, is greater than the ſurface of the ſegment of ſuch a ſphere whoſe baſe is the orifice of the tube. For a perſon ſpeaking at B, without the tube, will have the force of his voice ſpent in exciting concentric ſuperficies of air all around the point B; and when thoſe ſuperficies or pulſes of air are diffuſed as far as D every way, it is plain the force of the voice will there be diffuſed through the whole ſuperficies of a ſphere whoſe radius is BD; but in the trumpet it will be ſo confined, that at its exit it will be diffuſed through ſo much of that ſpherical ſurface of air as correſponds to the orifice of the tube. But ſince the force is given, its intenſity will always be inverſely as the number of particles it has to move; and therefore in the tube it will be to that without, as the ſuperficies of ſuch a ſphere to the æra of the large end of the tube nearly.

But it is obvious, Mr Young obſerves, that the confinement of the voice can have little effect in increaſing the ſtrength of the ſound, as this ſtrength depends on the velocity with which the particles move. Were this reaſoning concluſive, the voice ſhould iſſue through the ſmalleſt poſſible orifice; cylindrical tubes would be preferable to any that increaſed in diameter; and the leſs the diameter, the greater would be the effect of the inſtrument; becauſe the plate or maſs of air to be moved, would, in that caſe, be leſs, and conſequently the effect of the voice the greater; all which is contradicted by experience.

The cauſe of the increaſe of ſound in theſe tubes muſt therefore be derived from ſome other principles: and amongſt theſe we ſhall probably find, that what the ingenious Kircher has ſuggeſted in his Phonurgia is the moſt deſerving of our attention. He tells us, that "the augmentation of the ſound depends on its reflection from the tremulous ſides of the tube; which reflections, conſpiring in propagating the pulſes in the ſame direction, muſt increaſe its intenſity." Newton alſo ſeems to have conſidered this as the principal cauſe, in the ſcholium of prop. 50. B. 2. Princip. when he ſays, "we hence ſee why ſounds are ſo much increaſed in ſtentorophonic tubes, for every reciprocal motion is, in each return, increaſed by the generating cauſe."

Farther, when we ſpeak in the open air, the effect on the tympanum of a diſtant auditor is produced merely by a ſingle pulſe. But when we uſe a tube, all the pulſes propagated from the mouth, except thoſe in the direction of the axis, ſtrike againſt the ſides of the tube, and every point of impulſe becoming a new centre, from whence the pulſes are propagated in all directions, a pulſe will arrive at the ear from each of thoſe points; thus, by the uſe of a tube, a greater number of pulſes are propagated to the ear, and conſequently the ſound increaſed. The confinement too of the voice may have ſome effect, though not ſuch as is aſcribed to it by ſome; for the condenſed pulſes produced by the naked voice, freely expand every way; but in tubes, the lateral expanſion being diminiſhed, the direct expanſion will be increaſed, and conſequently the velocity of the particles, and the intenſity of the ſound. The ſubſtance alſo of the tube has its effect; for it is found by experiment, that the more elaſtic the ſubſtance of the tube, and conſequently the more ſuſceptible it is of theſe tremulous motions, the ſtronger is the ſound.

If the tube be laid on any non-elaſtic ſubſtance, it deadens the ſound, becauſe it prevents the vibratory motion of the parts. The ſound is increaſed in ſpeaking-trumpets, if the tube be ſuſpended in the air; becauſe the agitations are then carried on without interruption. Theſe tubes ſhould increaſe in diameter from the mouth-piece, becauſe the parts, vibrating in directions perpendicular to the ſurface, will conſpire in impelling forward the particles of air, and conſequently, by increaſing their velocity, will increaſe the intenſity of the ſound: and the ſurface alſo increaſing, the number of points of impulſe and of new propagations will increaſe

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(E) A cylindric or elliptic arch will anſwer ſtill better than one that is circular.

Reverberated Sounds.

proportionally. The ſeveral cauſes, therefore, of the increaſe of the ſound in theſe tubes, Mr Young concludes to be, 1. The diminution of the lateral, and conſequently the increaſe of the direct, expanſion and velocity of the included air. 2. The increaſe of the number of pulſes, by increaſing the points of new propagation. 3. The reflections of the pulſes from the tremulous ſides of the tube, which impel the particles of air forward, and thus increaſe their velocity.

26 Echoes. An echo is a reflection of ſound ſtriking againſt ſome object, as an image is reflected in a glaſs; but it has been diſputed what are the proper qualities in a body for thus reflecting ſounds. It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this image of ſound. We have heard of a very extraordinary echo, at a ruined fortreſs near Louvain, in Flanders. If a perſon ſung, he only heard his own voice, without any repetition: on the contrary, thoſe who ſtood at ſome diſtance, heard the echo but not the voice; but then they heard it with ſurpriſing variations, ſometimes louder, ſometimes ſofter, now more near, then more diſtant. There is an account in the memoirs of the French academy, of a ſimilar echo near Rouen.

As (by n° 21 and 22) every point againſt which the pulſes of ſounds ſtrike becomes the centre of a new ſeries of pulſes, and ſound deſcribes equal diſtances in equal times; therefore, when any ſound is propagated from a centre, and its pulſes ſtrike againſt a variety of obſtacles, if the ſum of the right lines drawn from that point to each of tohe bſtacles, and from each obſtacle to a ſecond point, be equal, then will the latter be a point in which an echo will be heard. "Thus let A be the point from which the ſound is propagated in all directions, and let the pulſes ſtrike againſt the obſtacles C, D, E, F, G, H, I, &c. each of theſe points becomes a new centre of pulſes by the firſt principle, and therefore from each of them one ſeries of pulſes will paſs through the point B. Now if the ſeveral ſums of the right lines $\overline{AC+CB}$, $\overline{AD+DB}$, $\overline{AE+EB}$, $\overline{AG+GB}$, $\overline{AH+HB}$, $\overline{AI+IB}$, &c. be all equal to each other, it is obvious that the pulſes propagated from A to theſe points, and again from theſe points to B, will all arrive at B at the ſame inſtant, according to the ſecond principle; and therefore if the hearer be in that point, his ear will at the ſame inſtant be ſtruck by all theſe pulſes. Now it appears from experiment (*ſee Muſſchenbroek, V.* ii. *p.* 210), that the ear of an exerciſed muſician can only diſtinguiſh ſuch ſounds as follow one another at the rate of 9 or 10 in a ſecond, or any ſlower rate: and therefore, for a diſtinct perception of the direct and reflected ſound, they ſhould intervene the interval of $\frac{1}{9}$th of a ſecond; but in this time ſound deſcribes $\frac{1142}{9}$ or 127 feet nearly. And therefore, unleſs the ſum of the lines drawn from each of the obſtacles to the points A and B exceeds the interval AB by 127 feet, no echo will be heard at B. Since the ſeveral ſums of the lines drawn from the obſtacles to the points A and B are of the ſame magnitude, it appears that the curve paſſing through all the points C, D, E, F, G, H, I, &c. will be an ellipſe, (*prop.* 14. *B.* 2. *Ham. Con.*) Hence alſo the points of the obſtacles which produce an echo, muſt lie in the ſurface of the oblong ſphæroid, generated by the revolution of this ellipſe round its major axis.

Reverberated Sounds.

"As there may be ſeveral ſphæroids of different magnitudes, ſo there may be ſeveral different echoes of the ſame original ſound. And as there may happen to be a greater number of reflecting points in the ſurface of an exterior ſphæroid than in that of an interior, a ſecond or a third echo may be much more powerful than the firſt, provided that the ſuperior number of reflecting points, that is, the ſuperior number of reflected pulſes propagated to the ear, be more than ſufficient to compenſate for the decay of ſound which ariſes from its being propagated through a greater ſpace. This is finely illuſtrated in the celebrated echoes at the lake of Killarney in Kerry, where the firſt return of the ſound is much inferior in ſtrength to thoſe which immediately ſucceed it.

"From what has been laid down it appears, that for the moſt powerful echo, the ſounding body ſhould be in one focus of the ellipſe which is the ſection of the echoing ſphæroid, and the hearer in the other. However, an echo may be heard in other ſituations, though not ſo favourably; as ſuch a number of reflected pulſes may arrive at the ſame time at the ear as may be ſufficient to excite a diſtinct perception. Thus, a perſon often hears the echo of his own voice; but for this purpoſe he ſhould ſtand at leaſt 63 or 64 feet from the reflecting obſtacle, according to what has been ſaid before. At the common rate of ſpeaking, we pronounce not above three ſyllables and an half, that is, ſeven half ſyllables in a ſecond; therefore, that the echo may return juſt as ſoon as three ſyllables are expreſſed, twice the diſtance of the ſpeaker from the reflecting object muſt be equal to 1000 feet; for, as ſound deſcribes 1142 feet in a ſecond, $\frac{6}{7}$ths of that ſpace, that is, 1000 feet nearly, will be deſcribed while ſix half or three whole ſyllables are pronounced: that is, the ſpeaker muſt ſtand near 500 feet from the obſtacle. And in general, the diſtance of the ſpeaker from the echoing ſurface, for any number of ſyllables, muſt be equal to the ſeventh part of the product of 1142 feet multiplied by that number.

"In churches we never hear a diſtinct echo of the voice, but a confuſed ſound when the ſpeaker utters his words too rapidly; becauſe the greateſt difference of diſtance between the direct and reflected courſes of ſuch a number of pulſes as would produce a diſtinct ſound is never in any church equal to 127 feet, the limit of echoes.

"But though the firſt reflected pulſes may produce no echo, both on account of their being too few in number, and too rapid in their return to the ear; yet it is evident, that the reflecting ſurface may be ſo formed, as that the pulſes which come to the ear after two reflections or more may, after having deſcribed 127 feet or more, arrive at the ear in ſufficient numbers, and alſo ſo nearly at the ſame inſtant, as to produce an echo, though the diſtance of the reflecting ſurface from the ear be leſs than the limit of echoes. This is confirmed by a ſingular echo in a grotto on the banks of the little brook called the Dinan, about two miles from Caſtlecomber, in the county of Kilkenny. As you enter the cave, and continue ſpeaking loud, no return of the voice is perceived; but on your arriving at a certain point, which is not above 14 or 15 feet from the reflecting ſurface, a very diſtinct echo is heard. Now this echo cannot ariſe from the firſt courſe of pulſes that are reflected to the ear, becauſe the breadth of the cave is ſo ſmall, that they would return too quickly to produce a diſtinct ſenſation from that of the original ſound: it therefore is produced by thoſe pulſes, which, after having been reflected ſeveral times from one ſide of the grotto to the other, and having run over a greater ſpace than 127 feet, arrive at the ear in conſiderable numbers, and not more diſtant from each other, in point of time, than the ninth part of a ſecond."

This article ſhall be diſmiſſed with a few inventions founded on ſome of the preceding principles, which may amuſe a number of our readers.

Entertaining Experiments and Contrivances.

27 I. The Converſive Statue, Plate I. fig. 5.

I. Place a concave mirror of about two feet diameter, as AB (G), in a perpendicular direction. The focus of this mirror may be at 15 or 18 inches diſtance from its ſurface. At the diſtance of about five or ſix feet let there be a partition, in which there is an opening E F, equal to the ſize of the mirror; againſt this opening muſt be placed a picture, painted in water-colours, on a thin cloth, that the ſound may eaſily paſs through it (H).

Behind the partition, at the diſtance of two or three feet, place another mirror GH, of the ſame ſize as the former, and let it be diametrically oppoſite to it.

At the point C let there be placed the figure of a man ſeated on a pedeſtal, and let his ear be placed exactly in the focus of the firſt mirror: his lower jaw muſt be made to open by a wire, and ſhut by a ſpring; and there may be another wire to move the eyes: theſe wires muſt paſs through the figure, go under the floor, and come up behind the partition.

Let a perſon, properly inſtructed, be placed behind the partition near the mirror. You then propoſe to any one to ſpeak ſoftly to the ſtatue, by putting his mouth to the ear of it, aſſuring him that it will anſwer inſtantly. You then give the ſignal to the perſon behind the partition, who, by placing his ear to the focus I, of the mirror GH, will hear diſtinctly what the other ſaid; and, moving the jaw and eyes of the ſtatue by the wires, will return an anſwer directly, which will in like manner be diſtinctly heard by the firſt ſpeaker.

This experiment appears to be taken from the Century of Inventions of the Marquis of Worceſter; whoſe deſigns, at the time they were publiſhed, were treated with ridicule and neglect as being impracticable, but are now known to be generally, if not univerſally practicable. The words of the Marquis are theſe: "How to make a brazen or ſtone head in the midſt of a great field or garden, ſo artificial and natural, that though a man ſpeak ever ſo ſoftly, and even whiſper into the ear thereof, it will preſently open its mouth, and reſolve the queſtion in French, Latin, Welſh, Iriſh, or Engliſh, in good terms, uttering it out of its mouth, and then ſhut it until the next queſtion be aſked."—The two following, of a ſimilar nature, appear to have been inventions of Kircher, by means of which (as he informs us*) he uſed to "utter feigned and ludicrous conſultations, with a view to ſhow the fallacy and impoſture of ancient oracles."

* *Phonurgia Nova*, ſect. vi. c. 1.

28 The Communicative Buſts.

II. Let there be two heads of plaſter of Paris, placed on pedeſtals, on the oppoſite ſides of a room. There muſt be a tin tube of an inch diameter, that muſt paſs from the ear of one head, through the pedeſtal, under the floor, and go up to the mouth of the other. Obſerve, that the end of the tube which is next the ear of the one head, ſhould be conſiderably larger than that end which comes to the mouth of the other. Let the whole be ſo diſpoſed that there may not be the leaſt ſuſpicion of a communication.

Now, when a perſon ſpeaks, quite low, into the ear of one buſt, the ſound is reverberated thro' the length of the tube, and will be diſtinctly heard by any one who ſhall place his ear to the mouth of the other. It is not neceſſary that the tube ſhould come to the lips of the buſt.—If there be two tubes, one going to the ear, and the other to the mouth, of each head, two perſons may converſe together, by applying their mouth and ear reciprocally to the mouth and ear of the buſts; and at the ſame time other perſons that ſtand in the middle of the chamber, between the heads, will not hear any part of their converſation.

29 The Oracular Head.

III. Place a buſt on a pedeſtal in the corner of a room, and let there be two tubes, as in the foregoing amuſement, one of which muſt go from the mouth and the other from the ear of the buſt, through the pedeſtal, and the floor, to an under apartment. There may be likewiſe wires that go from the under jaw and the eyes of the buſt, by which they may be eaſily moved.

A perſon being placed in the under room, and at a ſignal given applying his ear to one of the tubes, will hear any queſtion that is aſked, and immediately reply; moving at the ſame time, by means of the wires, the mouth and the eyes of the buſt, as if the reply came from it.

30 A Solar Sonata.

IV. In a large caſe, ſuch as is uſed for dials and ſpring-clocks, the front of which, or at leaſt the lower part of it, muſt be of glaſs, covered on the inſide with gauze, let there be placed a barrel-organ, which, when wound up, is prevented from playing, by a catch that takes a toothed wheel at the end of the barrel. To one end of this catch there muſt be joined a wire, at the end of which there is a flat circle of cork, of the ſame dimenſion with the inſide of a glaſs tube, in which it is to riſe and fall. This tube muſt communicate with a reſervoir that goes acroſs the front part of the bottom of the caſe, which is to be filled with ſpirits, ſuch as is uſed in ther-

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(G) Both the mirrors here uſed may be of tin or gilt paſteboard, this experiment not requiring ſuch as are very accurate.

(H) The more effectually to conceal the cauſe of this illuſion, the mirror AB may be fixed in the wainſcot, and a gauze or any other thin covering thrown over it, as that will not in the leaſt prevent the ſound from being reflected. An experiment of this kind may be performed in a field or garden, between two hedges, in one of which the mirror AB may be placed, and in the other an opening artfully contrived.

thermometers, but not coloured, that it may be the better concealed by the gauze.

This caſe being placed in the ſun, the ſpirits will be rarefied by the heat; and riſing in the tube, will lift up the catch or trigger, and ſet the organ in play: which it will continue to do as long as it is kept in the ſun; for the ſpirits cannot run out of the tube, that part of the catch to which the circle is fixed being prevented from riſing beyond a certain point by a check placed over it.

When the machine is placed againſt the ſide of a room on which the ſun ſhines ſtrong, it may conſtantly remain in the ſame place, if you incloſe it in a ſecond caſe, made of thick wood, and place it at a little diſtance from the other. When you want it to perform, it will be only neceſſary to throw open the door of the outer caſe, and expoſe it to the ſun.

But if the machine be moveable, it will perform in all ſeaſons by being placed before the fire; and in the winter it will more readily ſtop when removed into the cold.

A machine of this ſort is ſaid to have been invented by Cornelius Dreble, in the laſt century. What the conſtruction of that was, we know not; it might very likely be more complex, but could ſcarce anſwer the intention more readily.

31 Automatous Harpſichord.

V. Under the keys of a common harpſichord let there be fixed a barrel, ſomething like that in a chamber organ, with ſtops or pins correſponding to the tunes you would have it play. Theſe ſtops muſt be moveable, ſo that the tunes may be varied at pleaſure. From each of the keys let there go a wire perpendicular down: the ends of theſe wires muſt be turned up for about one-fourth of an inch. Behind theſe wires let there be an iron bar, to prevent them from going too far back. Now, as the barrel turns round, its pins take the ends of the wires, which pull down the keys, and play the harpſichord. The barrel and wires are to be all incloſed in a caſe.

In the chimney of the ſame room where the harpſichord ſtands, or at leaſt in one adjacent, there muſt be a ſmoke jack, from whence comes down a wire, or cord, that, paſſing behind the wainſcot adjoining the chimney, goes under the floor, and up one of the legs of the harpſichord, into the caſe, and round a ſmall wheel fixed on the axis of that firſt mentioned. There ſhould be pullies at different diſtances, behind the wainſcot and under the floor, to facilitate the motion of the cord.

This machinery may be applied to any other keyed inſtrument as well as to chimes, and to many other purpoſes where a regular continued motion is required.

An inſtrument of this ſort may be conſidered as a perpetual motion, according to the vulgar acceptation of the term; for it will never ceaſe going till the fire be extinguiſhed, or ſome parts of the machinery be worn out.

32 A Ventoſal Symphony, Plate I. fig. 6.

VI. At the top of a ſummer-houſe, or other building, let the wind-wheel B (of which A is an horizontal ſection,) be fixed, on the upper end of the perpendicular axis F; on the lower end of which is fixed the pinion C, that takes the toothed wheel D, on the axis of the great wheel E. The perpendicular axis F goes down very near the wall of the room, and may be covered after the ſame manner as are bell-wires. In the great wheel E there muſt be placed a number of ſtops, correſponding to the tunes it is to play. Theſe ſtops are to be moveable, that the tunes may be altered at pleaſure. Againſt this wheel there muſt hang 12 ſmall bells, anſwering to the notes of the gamut. Therefore, as the wheel turns round, the ſtops ſtriking againſt the bells, play the ſeveral tunes. There may be a fly to the great wheel, to regulate its motion when the wind is ſtrong. The wheel E, and the bells, are to be incloſed in a caſe.

There may be ſeveral ſets of bells, one of which may anſwer to the tenor, another to the treble, and a third to the baſs; or they may play different tunes, according to the ſize of the wheel. As the bells are ſmall, if they are of ſilver, their tone will be the more pleaſing.

Inſtead of bells, glaſſes may be here uſed, ſo diſpoſed as to move freely at the ſtroke of the ſtops. This machinery may likewiſe be applied to a barrel-organ; and to many other uſes.

ACQS, a town at the foot of the Pyrenæan mountains, in the government of Foix in France. It takes its name from the hot waters in theſe parts. E. long. 1. 40. Lat. 43. 0.

ACQUAPENDENTE, a pretty large town of Italy, in the territory of the church, and patrimony of St Peter, with a biſhop's ſee. It is ſeated on a mountain, near the river Paglia, ten miles W. of Orvietto, and 57 N. by W. of Rome. E. long. 11. 53. Lat. 42. 43.

ACQUARIA, a ſmall town of Italy, in Frigana, a diſtrict of Modena, which is remarkable for its medicinal waters. It is 12 miles ſouth of the city of Modena. E. long. 11. 17. Lat. 44. 24.

ACQUEST, or Acquist, in law, ſignifies goods got by purchaſe or donation. See Conquest.

ACQUI, a town of Italy, in the duchy of Montſerrat, with a biſhop's ſee, and commodious baths. It was taken by the Spaniards in 1745, and retaken by the Piedmonteſe in 1746; but after this, it was taken again and diſmantled by the French, who afterwards forſook it. It is ſeated on the river Bornio, 25 miles N. W. of Genoa, and 30 S. of Caſal. E. long. 8. 30. Lat. 44. 40.

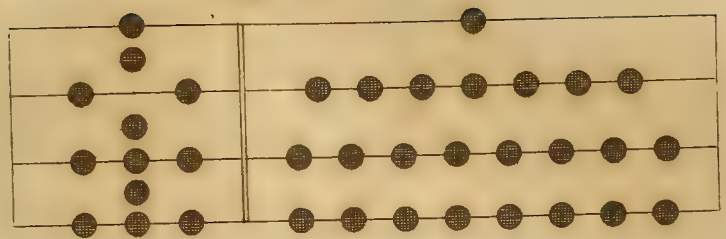
ACQUISITION, in general, denotes the obtaining or procuring ſomething. Among lawyers, it is uſed for the right or title to an eſtate got by purchaſe or donation.

ACQUITTAL, a diſcharge, deliverance, or ſetting of a perſon free from the guilt or ſuſpicion of an offence.

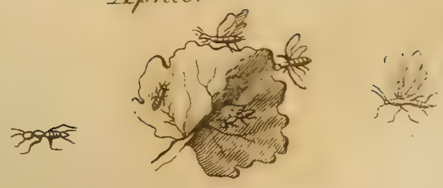
ACQUITTANCE, a releaſe or diſcharge in writing for a ſum of money, witneſſing that the party has paid the ſaid ſum.—No man is obliged to pay a ſum of money

Acarus.

ABACUS.



Aphis.



ACOUSTICS

Fig. 1.

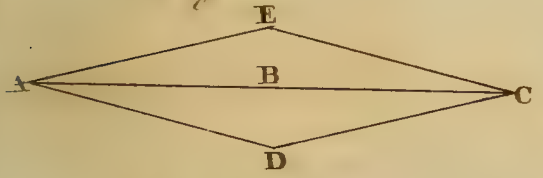


Fig. 2.

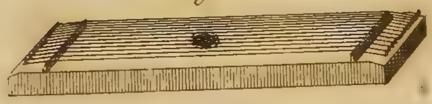
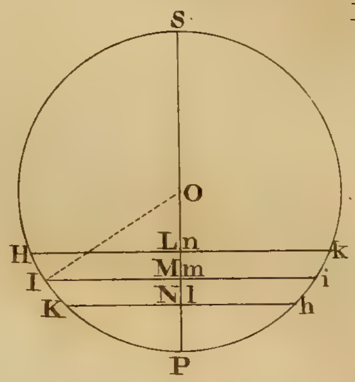


Fig. 7.



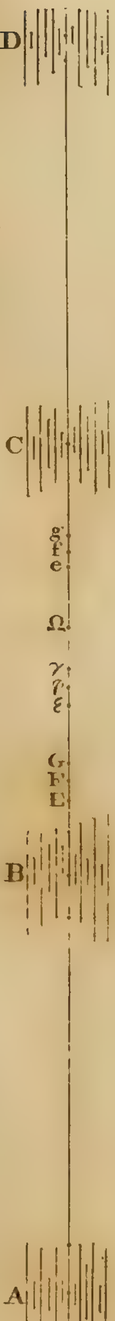


Fig. 3.

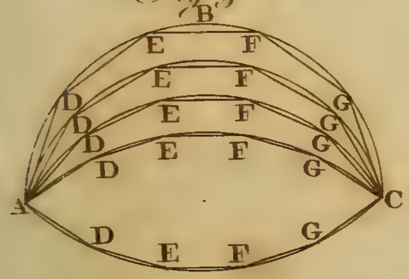


Fig. 4.

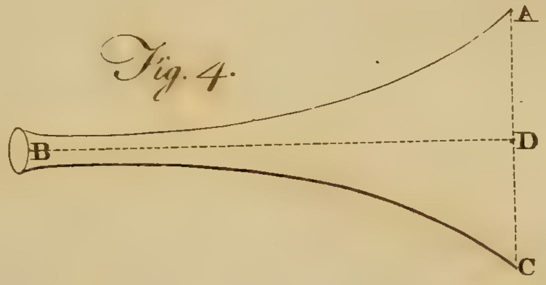


Fig. 5.

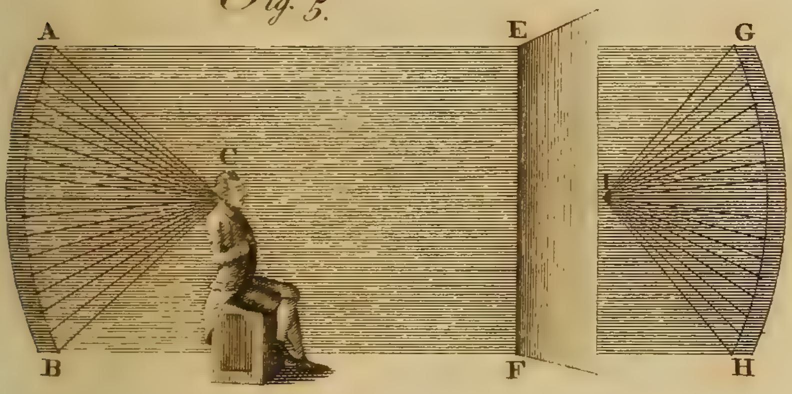
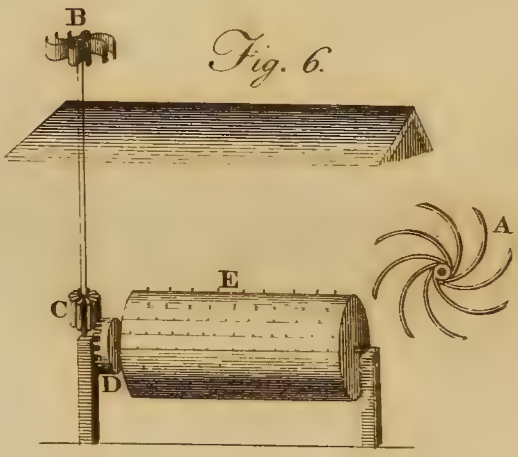


Fig. 6.



AEROSTATION.

Fig. 1.

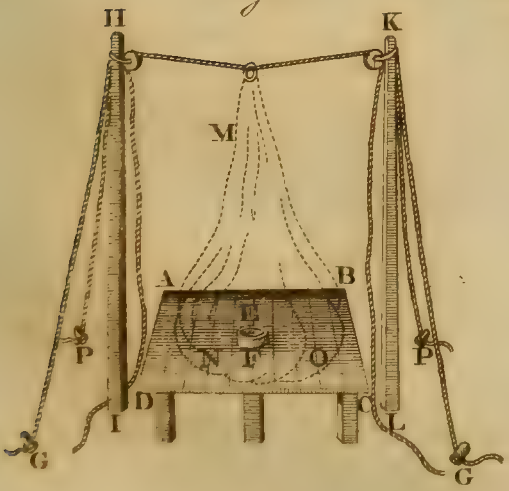
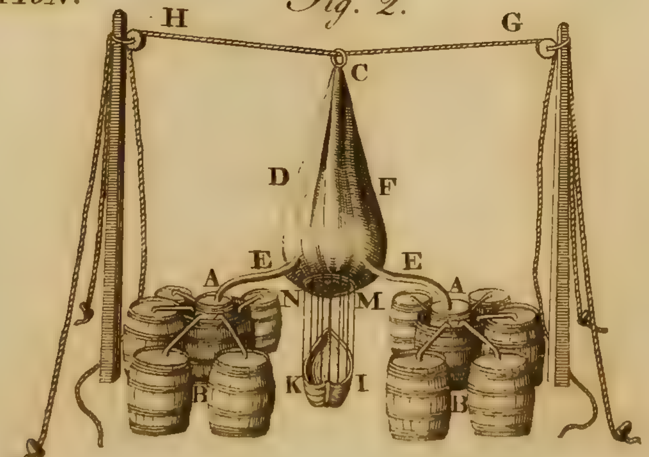


Fig. 2.



R. Scot sculp.

money if the demandant refuſes to give an acquittance, which is a full diſcharge, and bars all actions, &c. An acquittance given by a ſervant for a ſum of money received for the uſe of his maſter, ſhall be a good diſcharge for that ſum, provided the ſervant uſed to receive his maſter's rents, debts, &c.

ACRA, a town of Africa, on the coaſt of Guinea, where the Engliſh, Dutch, and Danes, have ſtrong forts, and each fort its particular village. W. long. 0. 2. Lat. 5. 0.

Acra (anc. geog.), one of the hills of Jeruſalem, on which ſtood the lower town, which was the Old Jeruſalem; to which was afterwards added Zion, or the city of David. Probably called *Acra*, from the fortreſs which Antiochus built there in order to annoy the temple, and which Simon Maccabæus took and razed to the ground.

Acra Japygia (anc. geog.), called *Salentia* by Ptolemy; now *Capo di San Maria di Leuca:* A promontory in the kingdom of Naples, to the ſouth-eaſt of Otranto, where formerly was a town, now lying in ruins, on the Ionian ſea, over againſt the Montes Acroceraunii of Epirus.

Acræ (anc. geog.), a town of Sicily, whoſe inhabitants were called *Acrenſes*. It ſtood to the ſouth of Syracuſe at the diſtance of 24 miles, near the place now called the monaſtery of *Santa Maria d'Arcia*, on an eminence, as appears from Silius Italicus. The Syracuſans were the founders of it, according to Thucydides, 70 years after the building of Syracuſe, or 665 before Chriſt. Hence the epithet *Acræus*.

ACRAGAS, or Agragas (anc. geog.), ſo called by the Greeks, and ſometimes by the Romans, but more generally *Agrigentum* by the latter; a town of Sicily. In Greek medals the inhabitants are called ΑΚΡΙΓΑΝΤΙΝΟΙ, and *Agrigentini* by Cicero. The town ſtood upon a mountain, at the confluence of the Acragas and Hypſa, near the port called Εμποδιον by Ptolemy, but Επινειον, or the Dock, by Strabo: and in the time of the latter, ſcarce a trace of all that ſide remained. In the year before Chriſt 584, the people of Gela built Acragas, 108 years after building their own city. It took its name from the river running by it; and being but two miles from, enjoyed all the conveniences that ſhould come by, the ſea. It was a place of great ſtrength, ſtanding on the top of a very ſteep rock, and waſhed on the ſouth ſide by the river Acragas, now called *Fiume di Gergenti*, and on the ſouth-weſt by the Hypſa, with a citadel to the ſouth-eaſt, externally ſurrounded by a deep gulph, which made it inacceſſible but on the ſide next the town. It was famous for the tyrant Phalaris and his brazen bull. They were a people luxurious in their tables, and magnificent in their dwellings; of whom Empedocles, in Diogenes Laertius, ſays, that they lived to-day as if they were to die to-morrow, and built as if they were to live for ever. The country round the city was laid out in vine and olive yards, in the produce of which they carried on a great and profitable commerce with Carthage. E. long. 13. 30. Lat. 37. 20.

ACRASIA, among phyſicians, implies the predominacy of one quality above another, either with regard to artificial mixtures, or the humours of the human body. The word is Greek, and compounded of α. priv. and κεροννυμι, to *mix*; q. d. not mixed in a juſt proportion.

ACRATH (anc. geog.), a place in Mauritania Tingitana, now ſuppoſed to be *Velez de Gomara:* A fortified town in the kingdom of Fez, with a citadel and commodious harbour on the Mediterranean, ſcarce a mile diſtant from Penon de Velez, a Spaniſh fort. W. long. 5. lat. 34. 45.

ACRE, or Acra, a ſea-port town in Syria. It was formerly called *Ptolemais*, and is a biſhop's ſee. It was very famous in the time of the cruſadoes, and underwent ſeveral ſieges both by the Chriſtians and Saracens. It is ſituated at the north angle of a bay, which extends in a ſemicircle of three leagues, as far as the point of Carmel.

During the cruſades, the poſſeſſion of this town was long diſputed by the Chriſtians and Saracens. In 1192 it was taken from the latter by Richard I. of England and Philip of France, who gave it to the knights of St. John of Jeruſalem, who kept poſſeſſion of it 100 years, when it was retaken by the Saracens, and almoſt entirely deſtroyed. This event is rendered memorable by an act of ſingular reſolution with which it was accompanied. A number of beautiful young nuns, terrified at the proſpect of being expoſed to the brutal luſt of the infidels, determined to avoid the violation of their chaſtity, by rendering themſelves objects of averſion. With this view they cut off their noſes and mangled their faces. The Saracens, inflamed with reſentment at a ſpectacle which prevented the gratification of their appetites, immediately put them all to the ſword. After the expulſion of the cruſaders, it remained almoſt deſerted: but in our time has again revived by the induſtry of Daher; and the works erected by Djezzar, within the laſt ten years, have rendered it one of the principal towns upon the coaſt. The moſque of this Pacha is boaſted as a maſterpiece of eaſtern taſte. The bazar, or covered market, is not inferior even to thoſe of Aleppo; and its public fountain ſurpaſſes in elegance thoſe of Damaſcus, though the water is of a very indifferent quality. The Pacha has derived the more honour from theſe works, as he was himſelf both the engineer and architect; he formed the plans, drew the deſigns, and ſuperintended the execution.

The port of Acre is one of the beſt ſituated on the coaſt, as it is ſheltered from the north and north-weſt winds by the town itſelf; but it is greatly choaked up ſince the time of Fakr-el-din. Djezzar has contented himſelf with making a landing place for boats. The fortifications, though more frequently repaired than any other in all Syria, are of no importance: there are only a few wretched low towers, near the port, on which cannon are mounted; and theſe ruſty iron pieces are ſo bad, that ſome of them burſt every time they are fired. Its defence on the land ſide is merely a garden-wall, without any ditch.

Corn and cotton form the baſis of the commerce of Acre, which is becoming more flouriſhing every day. Of late, the Pacha, by an abuſe common throughout all the Turkiſh empire, has monopolized all the trade in his own hands; no cotton can be ſold but to him, and from him every purchaſe muſt be made. In vain have the European merchants claimed the privileges granted them by the Sultan; Djezzar replied, that he was the Sultan in his country, and continued his monopoly. Theſe merchants in general are French, and have ſix houſes at Acre, with a conſul: an Imperial agent too has lately ſettled there; alſo a reſident for Ruſſia.

That part of the bay of Acre in which ſhips anchor with the greateſt ſecurity, lies to the north of Mount Carmel, below the village of Haifa (commonly called *Caiffa*). The bottom is good holding ground, and does not chafe the cables; but the harbour is open to the north-weſt wind, which blows violently along all this coaſt. Mount Carmel, which commands it to the ſouth, is a flattened cone, and very rocky; it is about 2000 feet high. We ſtill find among the brambles wild vines and olive trees, which prove that induſtry has formerly been employed even in this ungrateful ſoil: on the ſummit is a chapel dedicated to the prophet Elias, which affords an extenſive proſpect over the ſea and land. It is 20 miles S. of Tyre, and 37 N. of Jeruſalem. E. long. 39. 25. lat. 32. 40.

Acre, in the Mogul's dominions, the ſame with lack, and ſignifies the ſum of 100,000 rupees; the rupee is of the value of the French crown of three livres, or 30 ſols of Holland; an 100 lacks of rupees make a couron in Indoſtan, or 10,000,000 rupees: the pound Sterling is about eight rupees; according to which proportion, a lack of rupees amounts to 12,500 pounds Sterling.

Acre, the univerſal meaſure of land in Britain. The word (formed from the Saxon *acher*, or the German *aker*, a field), did not originally ſignify a determined quantity of land, but any open ground, eſpecially a wide champaign; and in this antique ſenſe it ſeems to be be preſerved in the names of places, as Caſtle-acre, Weſt-acre, &c. An acre in England contains four ſquare roods, a rood 40 perches or poles of 16½ feet each by ſtatute. Yet this meaſure does not prevail in all parts of England, as the length of the pole varies in different counties, and is called *cuſtomary meaſure*, the difference running from the 16½ feet to 28. The acre is alſo divided into 10 ſquare chains, of 22 yards each, that is 4840 ſquare yards. An acre in Scotland contains four ſquare roods; one ſquare rood is 40 ſquare falls; one ſquare fall, 36 ſquare ells; one ſquare ell, nine ſquare feet and 73 ſquare inches; one ſquare foot, 144 ſquare inches. The Scots acre is alſo divided into 10 ſquare chains; the meaſuring chain ſhould be 24 ells in length, divided into 100 links, each link 8$\frac{928}{1000}$ inches, and ſo one ſquare chain will contain 10,000 ſquare links. The Engliſh ſtatute-acre is about three roods and ſix falls ſtandard meaſure of Scotland.

The French acre, *arpent*, contains 1¼ Engliſh acre, or 54,450 ſquare Engliſh feet, whereof the Engliſh acre contains only 43,560.—The Straſburg acre is about half an Engliſh acre.—The Welch acre contains commonly two Engliſh ones.—The Iriſh acre is equal to one acre two roods and 19 perches $\frac{27}{121}$, Engliſh.

Dr Grew attempts to aſcertain the number of acres in England, which, according to him, amounts to 46 millions and 80,000. The United Provinces are ſaid to contain 4,382,000 acres: The province of Holland but one million of acres. The territory of the United States of America, according to calculation, lately made by order of Congreſs contains 589 millions of acres, excluſive of water, which is computed at 51 millions more.

Acre-Fight, an old ſort of duel fought by Engliſh and Scottiſh combatants, between the frontiers of their kingdoms, with ſword and lance: it was alſo called *camp-fight*, and the combatants *champions*, from the open field being the ſtage of trial.

Acre-Tax, a tax laid on land at ſo much per acre. In ſome places this is alſo called *acre-ſhot*. Impoſitions on lands in the great level are to be raiſed by a proportionable acre-tax, 20 Car. II. cap. 8.—An acre-tax of 2s. 6d. per acre, for draining Hadenham-level, 13 Geo. I. cap. 18.

ACRIBEIA, a term purely Greek, literally denoting an exquiſite or delicate accuracy; ſometimes uſed in our language, for want of a word of equal ſignification.

ACRID, a name for any thing that is of a ſharp or pungent taſte. See Materia Medica.

ACRIDOPHAGI, in the ancient geography, an Ethiopian people, repreſented as inhabiting near the deſarts, and to have fed on locuſts. This latter circumſtance their name imports; the word being compounded of the Greek *ακρις locuſt*, and *φαγω* to *eat*. We have the following account of them by Diodorus Siculus*. Their ſtature was lower than that of other men; they were meagre, and extremely black. In the ſpring, high weſt winds drove from the deſart to their quarter locuſts of an extraordinary ſize, and remarkable for the ſqualid colour of their wings. So great was the number of theſe inſects, that they were the only ſuſtenance of the barbarians, who took them in the following manner: At the diſtance of ſome ſtadia from their habitations there was a wide and deep valley. They filled this valley with wood and wild herbs, with which their country abounded. When the cloud of locuſts appeared, which were driven on by the wind, they ſet fire to the fuel which they had collected. The ſmoke which aroſe from this immenſe fire was ſo thick, that the locuſts, in croſſing the valley, were ſtifled by it, and fell in heaps on the ground. The paſſage of the locuſts being thus intercepted for many days, they made a large proviſion of thoſe inſects. As their country produced great quantities of ſalt, they ſalted them to render them more palatable, and to make them keep till the next ſeaſon. This peculiar ſupply was their ſole food: they had neither herds nor flocks. They were unacquainted with fiſhing: for they lived at a diſtance from the ſea. They were very active, and ran with great ſwiftneſs. But their life was not of a long duration; it exceeded not forty years. The cloſe of their life was extremely miſerable; for in their old age, winged lice of different, but all of ugly forms, bred in their bodies. This malady which began in the breaſt and belly, ſoon ſpread through the whole frame. The patient at firſt felt an itching; and the agreeable ſenſation produced by his ſcratching of himſelf, preceded a moſt deplorable calamity. For when thoſe lice, which had bred in his body, forced their way out, they cauſed effuſions of corrupt blood, with excruciating pains in the ſkin. The unhappy man, with lamentable cries, was induſtrious himſelf to make paſſages for them with his nails. In ſhort, theſe lice iſſued forth ſucceſſively from the wounds made by the hands of a patient, as from a veſſel full of holes, and in ſuch numbers that it was impoſſible to exterminate them.—Whether this extraordinary and dreadful diſtemper was occaſioned by the food of the inhabitants of this country, or by a peſtilential quality of their climate, it is difficult to determine. Indeed, as to the credibility of the whole account, we muſt leave the reader to judge.

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*Lib. iii. & xxxix. Alſo Strabo lib. xvi.

But though the circumſtances of theſe people ſhould be deemed fabulous, yet may the *acridophagia* be true. It is well known, that to this day the inhabitants of Ethiopia, Arabia, &c. frequently uſe locuſts as food. The reader will not be diſpleaſed if we lay before him the reſult of Dr Haſſelquiſt's inquiries as to this particular, who travelled in Syria and Egypt ſo late as the year 1752. This ingenious gentleman, who travelled with a view to improve natural hiſtory, informs us, that he aſked Franks, and many other people who had lived long in theſe countries, whether they had ever heard that the inhabitants of Arabia, Ethiopia, &c. uſed locuſts as food. They anſwered that they had. He likewiſe aſked the ſame queſtion of Armenians, Copts, and Syrians, who lived in Arabia, and had travelled in Syria and near the Red Sea; ſome of whom ſaid they heard of ſuch a practice, and others that they had often ſeen the people eat theſe inſects. He at laſt obtained complete ſatisfaction on this head from a learned ſheck at Cairo, who had lived ſix years in Mecca. This gentleman told him, in preſence of M. le Grand the principal French interpreter at Cairo, and others, that a famine frequently rages at Mecca when there is a ſcarcity of corn in Egypt, which obliges the inhabitants to live upon coarſer food than ordinary: That when corn is ſcarce, the Arabians grind the locuſts in hand-mills, or ſtone-mortars, and bake them into cakes, and uſe theſe cakes in place of bread: That he has frequently ſeen locuſts uſed by the Arabians, even when there was no ſcarcity of corn; but then they boil them, ſtew them with butter, and make them into a kind of fricaſſee; which he ſays is not diſagreeably taſted, for he had ſometimes taſted theſe locuſt-fricaſſees out of curioſity.

A later traveller, D. Sparrman, informs us *, "That locuſts ſometimes afford a high treat to the more unpoliſhed and remote hordes of the Hottentots; when, as ſometimes happens, after an interval of 8, 10, 15, or 20 years, they make their appearance in incredible numbers. At theſe times they come from the north, migrating to the ſouthward, and do not ſuffer themſelves to be impeded by any obſtacles, but fly boldly on, and are drowned in the ſea whenever they come to it. The females of this race of inſects, which are moſt apt to migrate, and are chiefly eaten, are ſaid not to be able to fly; partly by reaſon of the ſhortneſs of their wings, and partly on account of their being heavy and diſtended with eggs; and ſhortly after they have laid theſe in the ſand, they are ſaid to die. It is particularly of theſe that the Hottentots make a brown coffee-coloured ſoup, which, at the ſame time, acquires from the eggs a fat and greaſy appearance. The Hottentots are highly rejoiced at the arrival of theſe locuſts, though they are ſure to deſtroy every bit of the verdure on the ground: but the Hottentots make themſelves ample amends for this loſs, by falling foul on the animals themſelves, eating them in ſuch quantities as in the ſpace of a few days to get viſibly fatter and in better condition than before."

The abbé Poiret, alſo, in his Memoir on the Inſects of Barbary and Numidia, informs us, "That the Moors make locuſts a part of their food; that they go to hunt them; fry them in oil and butter; and ſell them publicly at Tunis, at Bonne," &c.

From theſe accounts, we may ſee the folly of that diſpute among divines about the nature of St John's food in the wilderneſs: ſome maintaining the original word to ſignify the fruits of certain trees; others, a kind of birds, &c.: but thoſe who adhered to the literal meaning of the text were at leaſt the moſt orthodox, although their arguments were perhaps not ſo ſtrong as they might have been, had they had an opportunity of quoting ſuch authors as the above.

ACRISIUS, king of Argos (fab. hiſt.), being told by the oracle that he ſhould be killed by his grandchild, ſhut up his only daughter Danaë in a brazen tower; but Jupiter coming down in a golden ſhower, begot Perſeus upon her: after Perſeus had ſlain the Gorgons, he carried Meduſa's head to Argos; which Acriſius ſeeing, was turned into a ſtatue.

ACRITAS (anc. geog.), a promontory of Meſſenia, running into the ſea, and forming the beginning of the bay of Meſſene; now called *Capo di Gallo*; between Methone to the weſt, and Corone to the eaſt, where the Sinus Coronæus begins.

ACROAMATIC, or ACROATIC, in general, denotes a thing ſublime, profound, or obſtruſe.

ACROAMATICI, a denomination given the diſciples or followers of Ariſtotle, &c. who were admitted into the ſecrets of the inner or acroamatic philoſophy.

ACROATIC. Ariſtotle's lectures to his diſciples were of two kinds, *exoteric* and *acroatic*. The acroatic were thoſe to which only his own diſciples and intimate friends were admitted; whereas the exoteric were public, and open to all. But there are other differences. The acroatic were ſet apart for the higher and more abſtruſe ſubjects; the exoteric were employed in rhetorical and civil ſpeculations. Again, the acroatics were more ſubtile and exact, evidence and demonſtration being here aimed at; the exoterics chiefly aimed at the probable and plauſible. The former were the ſubject of the mornings exerciſes in the Lyceum, the latter of the evenings. Add, that the exoterics were publiſhed: whereas the acroatics were kept ſecret; being either entirely concealed; or, if they were publiſhed, it was in ſuch obſcure terms, that few but his own diſciples could be the wiſer for them. Hence, when Alexander complained of his preceptor for publiſhing his acroatics, and thus revealing what ſhould have been reſerved to his diſciples, Ariſtotle anſwered, that they were made public and not public; for that none who had not heard them explained by the author *viva voce*, would underſtand them.

ACROATHOUM, or ACROTHOUM (anc. geog.), a town ſituated on the top of mount Athos, where the inhabitants, according to Mela, were longer lived by half than in any other country: called by the modern Greeks, Αγιον ορος; by the Italians, *La Cima di Monte Santo*.

ACROBATICA, or ACROBATICUM, from ακρος, *high*, and βατειν, or βαινω *I go*; an ancient engine, whereby people were raiſed aloft, that they might ſee more conveniently about them. The *acrobatica* among the Greeks amounted to the ſame with what they call *ſcanſorium* among the Latins. Authors are divided as to the office of this engine. Turnebus and Barbarus take it to have been of the military kind, raiſed by beſiegers, high enough to overlook the walls, and diſcover the ſtate of things on the other ſide. Baldus rather ſuppoſes it a kind of moveable ſcaffold, or cradle, contrived for raiſing painters, plaiſterers, and other workmen, to the tops of houſes, trees, &c. Some ſuſpect that it might have been uſed for both purpoſes; which is the opinion of Vitruvius and Aquinas.

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* *Voyage to the Cape*, vol. I. p. 36.

ACROCERAUNIA, or MONTES CERAUNII (anc. geog.), mountains running out into the ſea (ſo called from their being often thunderſtruck), ſeparating the Ionian ſea from the Adriatic; where Illyria ends and Epirus begins; now called *Monti della Chimera.*

ACROCHERISMUS, among the Greeks, a ſort of gymnaſtic exerciſe, in which the two combatants contended with their hands and fingers only, without cloſing or engaging the other parts of the body.

ACROCORINTHUS (anc. geog.), a high and ſteep hill, hanging over the city of Corinth, which was taken within the walls, as an acropolis, or citadel. On its top ſtood a temple of Venus; and lower down iſſued the fountain Pyrene.

ACROMION, in anatomy, the upper part of the ſcapula or ſhoulder-blade. See ANATOMY.

ACROMONOGRAMMATICUM, in poetry, a kind of poem, wherein every ſubſequent verſe begins with the letter wherewith the immediately preceding one terminated.

ACRON, a celebrated phyſician of Agrigentum, who firſt thought of lighting large fires, and purifying the air with perfumes, to put a ſtop to the peſtilence that ravaged Athens, and which was attended with ſucceſs. He lived about 473 years before the Chriſtian æra.

ACRON, a territory on the gold-coaſt of Guinea, in Africa, bordering on the Fantynean country. The Dutch have a fort here called Fort Patience; and under it is a village, inhabited only by fiſhermen. The other inhabitants are addicted to huſbandry, and ſell their corn to other countries. There is plenty of game, which is very commodious for the Dutch factory. The people are very ignorant, and go naked like the reſt of the negroes. This is called Little Acron; for Great Acron is farther inland, and is a kind of a republic.

ACRONICAL, ACHRONYCAL, or ACHRONICAL, in aſtronomy, is a term applied to the riſing of a ſtar, when the ſun is ſet in the evening; but has been promiſcuouſly uſed to expreſs a ſtar's riſing at ſunſet, or ſetting at ſun-riſe.

ACRONIUS LACUS, (Mela); a ſmall lake formed by the Rhine, ſoon after its riſe out of the Alps, and after paſſing the greater lake at Conſtance, called *Venetus*, and now the *Bodengee*, or lake of Conſtance.

ACROPOLIS (anc. geog.), the citadel, and one of the diviſions of Athens; called *Polis*, becauſe conſtituting the firſt and original city; and the *Upper* Polis, to diſtinguiſh it from the Lower, which was afterwards built round it in a large open plain, the Acropolis ſtanding on a rock or eminence in the heart of this plain; and hence its name: To the north it had a wall, built by the Pelaſgi, and therefore called *Pelaſgic*; and to the ſouth a wall, by Cymon the ſon of Miltiades, out of the Perſian ſpoils, many ages after the building of the north wall. It had nine gates, and was therefore called *Enneapylon*; yet but one principal gate of entrance, the aſcent to which was by a flight of ſteps of white marble, built by Pericles with great magnificence, (Plutarch).

ACROPOLITA (George), one of the writers in the Byzantine hiſtory, was born at Conſtantinople, in the year 1220, and brought up at the court of the emperor John Ducas at Nice. He was employed in the moſt important affairs of the empire; being ſent ambaſſador to Lariſſa, to eſtabliſh a peace with Michael of Epirus; and was conſtituted judge to try Michael Comnenus, ſuſpected of engaging in a conſpiracy. Theodorus Laſcaris, the ſon of John, whom he had taught logic, appointed him governor of all the weſtern provinces in his empire. In 1255, he was taken priſoner in a war with Michael Angelus: but gaining his liberty in 1260, by means of the emperor Palæologus, he was ſent by him ambaſſador to Conſtantine prince of Bulgaria; and was employed in ſeveral other negociations. He wrote, A Continuation of the Greek Hiſtory, from the taking of Conſtantinople by the Latins till it was recovered by Michael Palæologus in 1261, which makes part of the Byzantine hiſtory; A Treatiſe concerning Faith, Virtue, and the Soul; An Expoſition of the Sermons of St Gregory Nazianzen and other pieces. Gregory Cyprian, patriarch of Conſtantinople, in his encomium upon him, prefixed to Acropolita's hiſtory, is perhaps ſomewhat extravagant in his praiſe, when he ſays he was equal to Ariſtotle in philoſophy, and to Plato in the knowledge of divine things and Attic eloquence.

ACROSPIRE, a vulgar term for what botaniſts call the *plume*. See the article PLANTS.

ACROSPIRED, in malt-making, is the grain's ſhooting both at the root and blade end.

ACROSTIC, in poetry, a kind of poetical compoſition, diſpoſed in ſuch a manner, that the initial letters of the verſes form the name of ſome perſon, kingdom, place, motto, &c. The word is compounded of the Greek ακρος, *extremity*, and στιχος, *verſe*. The acroſtic is conſidered by the critics as a ſpecies of falſe wit, and is therefore very little regarded by the moderns.

ACROSTICUM, RUSTYBACK, WALL-RUE, or FORK-FERN, in botany, a genus of the cryptogamia filices. The fructifications are accumulated on the whole inferior ſurface of the frond, ſo that they everywhere cover it. There are upwards of 30 ſpecies; but only three of them (according to others, two) are natives of Britain, *viz.* the ſeptentrionale, or horned fern, which grows on walls or clifts of rocks; the ilvenſe, or hairy fern, growing in clifts of rocks; and the thelypteris, or marſh-fern, in turfy bogs.

ACROSTOLIUM, in ancient naval architecture, the extreme part of the ornament uſed on the prows of their ſhips, which was ſometimes in the ſhape of a buckler, helmet, animal, &c.; but more frequently circular, or ſpiral. It was uſual to tear them from the prows of vanquiſhed veſſels, and fix them to the conquerors, as a ſignal of victory.

Acroteleutic, ‖ Act.

ACROTELEUTIC, among eccleſiaſtic writers, an appellation given to any thing added to the end of a pſalm; as the Gloria Patri, or Doxology.

ACROTERIA, in architecture, ſmall pedeſtals, uſually without baſes, anciently placed at the middle or two extremes of pediments or frontiſpieces, ſerving to ſupport the ſtatues, &c. It alſo ſignifies the figures placed as ornaments on the tops of churches, and the ſharp pinnacles that ſtand in ranges about flat buildings with rails and balluſters.

Among ancient phyſicians, it ſignified the larger extremities of the body, as the head, hands, and feet. It has alſo been uſed for the tips of the fingers, and ſometimes for the eminences or proceſſes of bones.

ACROTHYMION, from ακρος, *extreme* and θυμος, *thyme*. A ſort of wart deſcribed by Celſus as hard, rough, with a narrow baſis and broad top; the top is of the colour of thyme; it eaſily ſplits and bleeds. This tumour is alſo called *thymus*.

ACT, in general, denotes the execution of power; and differs from power, as the effect from the cauſe.

Act, in logic, is particularly underſtood of an operation of the human mind. Thus to diſcern and examine, are acts of the underſtanding; to judge and affirm, are acts of the will. There are voluntary and ſpontaneous acts; the former are produced by the operation of the ſoul, the latter without its privity or participation.

Act, in the univerſities, ſignifies a theſis maintained in public by a candidate for a degree, or to ſhow the capacity and proficiency of a ſtudent. The candidates for a degree of bachelor and maſter of arts are to hold philoſophical Acts; and thoſe for bachelor of divinity, theological Acts, &c. At Oxford, the time when maſters or doctors complete their degrees is alſo called the *act;* which is held with great ſolemnity. At Cambridge, they call it the *commencement*.

Act of Faith, *Auto da Fe*, in the Romiſh church, is a ſolemn day held by the inquiſition, for the puniſhment of heretics, and the abſolution of the innocent accuſed*. They uſually contrive the *Auto* to fall on ſome great feſtival, that the execution may paſs with the more awe and regard; at leaſt it is always on a Sunday.

* See *Inquiſition*.

The Auto da Fe may be called the laſt act of the inquiſitorial tragedy; it is a kind of gaol-delivery, appointed as oft as a competent number of priſoners in the inquiſition are convicted of hereſy, either by their own voluntary, or extorted confeſſion, or on the evidence of certain witneſſes. The proceſs is thus: in the morning they are brought into a great hall, where they have certain habits put on, which they are to wear in the proceſſion. The proceſſion is led up by dominican friars; after which come the penitents, ſome with ſan-benitoes, and ſome without, according to the nature of their crimes; being all in black coats without ſleeves, and bare-footed, with a wax candle in their hands. Theſe are followed by the penitents who have narrowly eſcaped being burnt, who over their black coats have flames painted with their points turned downwards, *Feugo revolto*. Next come the negative, and relapſed, who are to be burnt, having flames on their habits pointing upwards. After theſe come ſuch as profeſs doctrines contrary to the faith of Rome, who, beſides flames pointing upwards, have their picture painted on their breaſts, with dogs, ſerpents, and devils, all open-mouthed, about it.

Act.

Each priſoner is attended with a familiar of the inquiſition; and thoſe to be burnt have alſo a Jeſuit on each hand, who are continually preaching to them to abjure. After the priſoners, comes a troop of familiars on horſeback; and after them the inquiſitors, and other officers of the court, on mules; laſt of all, the inquiſitor-general on a white horſe, led by two men with black hats and green hat-bands. A ſcaffold is erected in the *Terriero de Paio*, big enough for two or three thouſand people; at one end of which are the priſoners, at the other the inquiſitors. After a ſermon made up of encomiums on the inquiſition, and invectives againſt heretics, a prieſt aſcends a deſk near the middle of the ſcaffold, and having taken the abjuration of the penitents, recites the final ſentence of thoſe who are to be put to death; and delivers them to the ſecular arm, earneſtly beſeeching at the ſame time the ſecular power not to touch their blood, or put their lives in danger. The priſoners being thus in the hands of the civil magiſtrate, are preſently loaded with chains, and carried firſt to the ſecular gaol, and from thence in an hour or two brought before the civil judge; who, after aſking in what religion they intend to die, pronounces ſentence, on ſuch as declare they die in the communion of the church of Rome, that they ſhall be firſt ſtrangled, and then burnt to aſhes; on ſuch as die in any other faith, that they be burnt alive. Both are immediately carried to the Ribera, the place of execution; where there are as many ſtakes ſet up as there are priſoners to be burnt, with a quantity of dry furz about them. The ſtakes of the profeſſed, that is, ſuch as perſiſt in their hereſy, are about four yards high, having a ſmall board towards the top for the priſoner to be ſeated on. The negative and relapſed being firſt ſtrangled and burnt, the profeſſed mount their ſtakes by a ladder; and the Jeſuits, after ſeveral repeated exhortations to be reconciled to the church, part with them, telling them they leave them to the devil, who is ſtanding at their elbow to receive their ſouls, and carry them with him into the flames of hell. On this a great ſhout is raiſed; and the cry is, Let the dogs *beards be made;* which is done by thruſting flaming furzes faſtened to long poles againſt their faces, till their faces are burnt to a coal, which is accompanied with the loudeſt acclamations of joy. At laſt, fire is ſet to the furz at the bottom of the ſtake, over which the profeſſed are chained ſo high, that the top of the flame ſeldom reaches higher than the ſeat they ſit on; ſo that they rather ſeem roaſted than burnt. There cannot be a more lamentable ſpectacle; the ſufferers continually cry out, while they are able, *Miſericordia per amor de Dios*, "Pity for the love of God!" yet it is beheld by all ſexes, and ages, with tranſports of joy and ſatisfaction.

Act, in dramatic poetry, ſignifies a certain diviſion, or part, of a play, deſigned to give ſome reſpite both to the actors and ſpectators. The Romans were the firſt who divided their theatrical pieces into acts; for no ſuch diviſions appear in the works of the firſt dramatic poets. Their pieces indeed conſiſted of ſeveral parts or diviſions, which they called *protaſis*, *epitaſis*, *cataſtaſis*, and *cataſtrophe;* but theſe diviſions were not marked by any real interruptions on the theatre. Nor does Ariſtotle mention any thing of acts in his Art of Poetry. But, in the time of Horace, all regular and finiſhed pieces were divided into five acts.

Neuve minor, neu ſit quinto productior actu
Fabula, quæ poſci vult & ſpectata reponi.

The firſt act, according to ſome critics, beſides introducing upon the ſtage the principal characters of the play, ought to propoſe the argument or ſubject of the piece; the ſecond, to exhibit this to the audience, by carrying the fable into execution; the third, to raiſe obſtacles and difficulties; the fourth, to remove theſe, or raiſe new ones in the attempt; and the fifth, to conclude the piece, by introducing ſome accident that may unravel the whole affair. This diviſion, however, is not eſſentially neceſſary; but may be varied according to the humour of the author, or the nature of the ſubject. See POETRY, Part II. Sect. i.

ACT of Grace. See GRACE.

ACT, among lawyers, is an inſtrument in writing for declaring or juſtifying the truth of any thing. In which ſenſe, records, decrees, ſentences, reports, certificates, &c. are called *acts*.

ACTS, alſo denote the deliberations and reſolutions of an aſſembly, ſenate, or convention; as acts of parliament, &c. Likewiſe matters of fact tranſmitted to poſterity in certain authentic books and memoirs.

ACTA Conſiſtorii, the edicts or declarations of the council of ſtate of the emperors. Theſe edicts were generally expreſſed in ſuch terms as theſe: "The auguſt emperors, *Diocleſian* and *Maximian*, in council declared, That the children of Decurions ſhould not be expoſed to wild beaſts in the amphitheatre."

The ſenate and ſoldiers often ſwore, either through abject flattery or by compulſion, upon the *edicts* of the emperor, as we do upon the *bible*. And the name of *Apidius Merula* was eraſed by Nero out of the regiſter of ſenators, becauſe he refuſed to ſwear upon the edicts of the emperor Auguſtus.

ACTA Diurna, was a ſort of Roman gazette, containing an authorized narrative of the tranſactions worthy of notice which happened at Rome. Petronius has given us a ſpecimen of the *acta diurna* in his account of Trimalchis; and as it may not perhaps be unentertaining to ſee how exactly a Roman newſpaper runs in the ſtyle of an American one, the following is an article or two out of it:

"On the 26th of July, 30 boys and 40 girls were born at Trimalchi's eſtate at Cuma.

"At the ſame time a ſlave was put to death for uttering diſreſpectful words againſt his lord.

"The ſame day a fire broke out in Pompey's gardens, which began in the night, in the ſteward's apartment."

ACTA Populi, among the Romans, were journals or regiſters of the daily occurrences; as aſſemblies, trials, executions, buildings, births, marriages, deaths, &c. of illuſtrious perſons, and the like. Theſe were otherwiſe called *Acta Publica*, and *Acta Diurna*, or ſimply *Acta*. The *Acta* differed from Annals, in that only the greater and more important matters were in the latter, and thoſe of leſs note were in the former. Their origin is attributed to Julius Cæſar, who firſt ordered the keeping and making public the acts of the people. Some trace them higher, to Servius Tullius; who, to diſcover the number of perſons born, dead, and alive, ordered that the next of kin, upon a birth, ſhould put a certain piece of money into the treaſury of Juno Lucina; upon a death, into that of Venus Libitina: the like was alſo to be done upon aſſuming the toga virilis, &c. Under Marcus Antoninus, this was carried further: perſons were obliged to notify the births of their children, with their names and ſurnames, the day, conſul, and whether legitimate or ſpurious, to the præfects of the *Ærarium Saturni*, to be entered in the public acts; though before this time the births of perſons of quality appear thus to have been regiſtered.

ACTA Senatus, among the Romans, were minutes of what paſſed and was debated in the ſenate-houſe. Theſe were alſo called *Commentarii*, and by a Greek name υπομνηματα. They had their origin in the conſulſhip of Julius Cæſar, who ordered them both to be kept and publiſhed. The keeping them was continued under Auguſtus, but the publication was abrogated. Afterwards all writings, relating to the decrees or ſentences of the judges, or what paſſed and was done before them, or by their authority, in any cauſe, were alſo called by the name *Acta*: In which ſenſe we read of civil acts, criminal acts, intervenient acts; *acta civilia, criminalia, intervenientia*, &c.

Public ACTS. The knowledge of public acts forms part of a peculiar ſcience, called the DIPLOMATIC, of great importance to an hiſtorian, ſtateſman, chronologer, and even critic. The preſervation of them was the firſt occaſion of erecting libraries. The ſtyle of acts is generally barbarous Latin. Authors are divided as to the rules of judging of their genuineneſs, and even whether there be any certain rules at all. F. Germon will have the greater part of the acts of former ages to be ſpurious. Fontanini aſſerts, that the number of forged acts now extant is very ſmall. It is certain there were ſevere puniſhments inflicted on the forgers and falſifiers of acts.—The chief of the Engliſh acts, or public records, are publiſhed by Rymer, under the title of *Fœdera*, and continued by Saunderſon; an extract whereof has been given in French by Rapin, and tranſlated into Engliſh under the title of *Acta Regia*. Great commendations have been given this work: alſo ſome exceptions made to it; as that there are many ſpurious acts, as well as errors, in it; ſome have even charged it with falſifications.—The public acts of France fell into the hands of the Engliſh after the battle of Poitiers, and are commonly ſaid to have been carried by them out of the country. But the tradition is not ſupported by any ſufficient teſtimony.

ACTS of the Apoſtles, one of the ſacred books of the New Teſtament, containing the hiſtory of the infant-church, during the ſpace of 29 or 30 years from the aſcenſion of our Lord to the year of Chriſt 63.—It was written by St Luke; and addreſſed to Theophilus, the perſon to whom the evangeliſt had before dedicated his goſpel. We here find the accompliſhment of ſeveral of the promiſes made by our Saviour; his aſcenſion; the deſcent of the Holy Ghoſt; the firſt preaching of the apoſtles, and the miracles whereby their doctrines were confirmed; an admirable picture of the manners of the primitive Chriſtians; and, in ſhort, every thing that paſſed in the church till the diſperſion of the apoſtles, who ſeparated themſelves in order to propagate the goſpel throughout the world. From the period of that ſeparation, St Luke quits the hiſtory of the other apoſtles, who were then at too great a diſtance from him, and confines himſelf more particularly to that of St Paul, who had choſen him for the companion of his labours. He follows that apoſtle in all his miſſions, and even to Rome itſelf; for it appears that the Acts were publiſhed in the ſecond year of St Paul's reſidence in that city, or the 36th year of the Chriſtian æra, and in the 9th or 10th year of Nero's reign. The ſtyle of this work, which was originally compoſed in Greek, is much purer than that of the other canonical writers: and it is obſervable, that St Luke, who was much better acquainted with the Greek than with the Hebrew language, always, in his quotations from the Old Teſtament, makes uſe of the Septuagint verſion. The council of Laodicea places the Acts of the Apoſtles among the canonical books, and all the churches have acknowledged it as ſuch without any controverſy.

There were ſeveral *Spurious* ACTS OF THE APOSTLES; particularly, I. *Acts*, ſuppoſed to be written by Abdias,* the pretended biſhop of Babylon, who gave out that he was ordained biſhop by the apoſtles themſelves when they were upon their journey into Perſia. II. *The Acts of St. Peter:* this book came originally from the ſchool of the Ebionites. III. *The Acts of St. Paul*, which is entirely loſt. Euſebius, who had ſeen it, pronounces it of no authority. IV. *The Acts of St. John the Evangeliſt;* a book made uſe of by the Encratites, Manichæans, and Priſcillianiſts. V. *The Acts of St. Andrew;* received by the Manichæans, Encratites, and Apotactics. VI. *The Acts of St. Thomas the Apoſtle;* received particularly by the Manichæans. VII. *The Acts of St. Philip.* This book the Gnoſtics made uſe of. VIII. *The Acts of St. Matthias.* Some have imagined that the Jews for a long time had concealed the original acts of the life and death of St. Matthias written in Hebrew; and that a monk of the abbey of St. Matthias at Treves, having got them out of their hands, procured them to be tranſlated into Latin, and publiſhed them; but the critics will not allow them to be authentic.

*See *Abdias*.

ACTS of Pilate; a relation ſent by Pilate to the emperor Tiberius, concerning Jeſus Chriſt, his death, reſurrection, aſcenſion, and the crimes of which he was convicted before him.† It was a cuſtom among the Romans, that the proconſuls and governors of provinces ſhould draw up acts, or memoirs, of what happened in the courſe of their government, and ſend them to the emperor and ſenate. The genuine *acts* of Pilate were ſent by him to Tiberius, who reported them to the ſenate; but they were rejected by that aſſembly, becauſe not immediately addreſſed to them; as is teſtified by Tertullian, in his Apol. cap. 5. and 20, 21. The heretics forged acts in imitation of them: in the reign of the emperor Maximin, the Gentiles, to throw an odium on the Chriſtian name, ſpread about ſpurious Acts of Pilate; which the emperor, by a ſolemn edict, ordered to be ſent into all the provinces of the empire, and enjoined the ſchoolmaſters to teach and explain them to their ſcholars, and make them learn them by heart. Theſe acts, both the genuine and the ſpurious, are loſt. There is indeed extant, in the Pſeudo-Hegeſippus, a letter from Pilate to the emperor Claudius, concerning Jeſus Chriſt ‡; but it diſcovers itſelf at firſt ſight not to be authentic.

† Euſeb ii. *Hiſt. Eccleſ.* lib. 2. cap. 2. and ix. 5.

‡ Cave *Hiſt. Literar. Sæc. Apoſtol.*

ACT of Parliament of Great Britain, is a poſitive law, conſiſting of two parts, the words of the act, and its true ſenſe and meaning, which being joined, make the law. The words of acts of parliament ſhould be taken in a lawful ſenſe. Caſes of the ſame nature are within the intention, though without the letter, of the act; and ſome acts extend by equity to things not mentioned therein. See PARLIAMENT.

ACTÆ, were meadows of remarkable verdure and luxuriancy near the ſea-ſhore, where the Romans uſed to indulge themſelves to a great degree in ſoftneſs and delicacy of living. The word is uſed in this ſenſe by Cicero and Virgil; but Voſſius thinks it can only be uſed in ſpeaking of Sicily, as theſe two authors did.

ACTÆA, ACONITUM RACEMOSUM, HERB CHRISTOPHER, or BANE-BERRIES; a genus of the monogynia order, belonging to the polyandria claſs of plants. The characters are: The *calyx* is a perianthium, conſiſting of four roundiſh, obtuſe, concave leaves, which fall off. The *corolla* conſiſts of four petals, larger than the calyx, pointed at both ends, and falling off. The *ſtamina* conſiſt of numerous capillary filaments; the antheræ are roundiſh, erect, and didymous. The *piſtillum* has an ovate germen; no ſtylus; the ſtigma thickiſh, and obliquely depreſſed. The *pericarpium* is an oval ſmooth one-furrow'd one-cell'd berry. The *ſeeds* are very numerous, ſemiorbicular, and incumbent in a double order.—This genus is aſſociated with the *Multiſiliquæ*, the 26th natural order. There are four

Species and properties. 1. The ſpicata, or common herb-chriſtopher, is a native in ſeveral parts of Britain. It grows to the height of about two feet and an half: the foot-ſtalks of the leaves ariſe from the root; theſe divide into three ſmaller foot-ſtalks, each of which are again divided into three, and theſe have each three lobes; ſo that each leaf is compoſed of 27 lobes or ſmaller leaves. The flowers grow in ramous ſpikes, and are of a pure white: they are borne upon a ſlender, jointed, and furrowed ſtem; appear in May; and are ſucceeded by black, ſhining, pulpy berries, about the ſize of peas, which ripen in the autumn. This plant is a powerful repellent, and the root has been uſed internally in ſome nervous caſes, but muſt be adminiſtered with caution. The berries are highly poiſonous. It is ſaid toads reſort to this plant, on account of its fetid ſmell. Sheep and goats eat it; cows, horſes, and ſwine, refuſe it. 2. The alba, or American herb-chriſtopher, is a native of North America. The leaves of this ſpecies are ſomewhat like the former, but not ſo deeply indented in the edges. The flowers grow in a more compact ſpike, and the berries are very white and tranſparent when ripe; the roots are compoſed of thick knobs. This ſpecies has been uſed as an emetic, and ſometimes called *ipecacoanha*. 3. The racemoſa, or American black or wild ſnakeroot, is likewiſe a native of North America. It has large compound leaves, riſing immediately from the root, and branched after the ſame manner as the firſt, which grow more than two feet high. The flower-ſtem riſes to the height of four or five feet; and carries a long ſpike of white flowers reflexed at the top. Theſe appear in June or the beginning of July, but the ſeeds do not come to maturity in Britain. The root of this plant is greatly uſed by phyſicians in North America, in many diſorders; and is ſuppoſed to be an antidote againſt poiſon, or the biting of a rattleſnake. 4. The cimicifuga, is a native of Siberia; the leaves reſemble thoſe of the feathered columbine; the ſtalks riſe little more than a foot high, ſupporting particles of white flowers, which appear in May. This ſpecies is rare in Britain.

Culture. The firſt ſpecies hath a perennial root, but the ſtalks annually decay. It may be propagated either by ſeeds, or parting the roots, which ſhould be tranſplanted in autumn. The ſeeds ſhould be ſown ſoon after they are ripe, or they will lie a whole year in the ground before they vegetate. They ſhould be ſown in a ſhady border; and as all the plants do not come up at the ſame time, the border ſhould not be diſturbed till the following autumn, when they ſhould be tranſplanted into a ſhady border, where they may be allowed to remain and flower.—The ſecond ſpecies may be propagated in the ſame manner; only the plants ſhould be allowed three feet every way, on account of their wide-ſpreading leaves. This ſpecies delights in a light moiſt ſoil, and a ſhady ſituation.—The third is uſually propagated by ſeeds ſent annually from North America: it thrives in the ſame kind of ſoil as the former; and is very hardy, requiring no other culture than the common flowering-ſhrubs. The plants ſhould not be often removed, for that will prevent their flowering ſtrong.—The fourth requires a moiſt loamy ſoil, and ſhady ſituation. It may be propagated in the ſame manner as the others.

ACTÆON, in fabulous hiſtory, the ſon of Ariſtæus and Autonoe; a great hunter. He was turned by Diana into a ſtag, for looking on her while bathing; and died by his own dogs.

ACTANIA, an iſland, according to Pliny, in the North ſea. It lies to the weſt of Holſtein and Ditmerſch, not far from the mouth of the Eyder and Elbe, and is now called *Heyligland*.

ACTE. See SAMBUCUS.

ACTIAN GAMES, in Roman antiquity, were ſolemn games inſtituted by Auguſtus, in memory of his victory over Marc Anthony at Actium, held every fifth year, and celebrated in honour of Apollo, ſince called *Actius*. Hence *Actian* Years, an æra commencing from the battle of Actium, called the *Æra of Auguſtus*.

Virgil inſinuates them to have been inſtituted by Æneas: from that paſſage Æn. III. v. 280.

> *Actiaque Iliacis celebramus littora ludis.*
>
> ÆN. iii. 250.

But this he only does by way of compliment to Auguſtus; attributing that to the hero from whom he deſcended, which was done by the emperor himſelf: as is obſerved by Servius.

ACTINIA, in zoology, a genus belonging to the order of vermes molluſca. The body is oblong and ſmooth, attaching itſelf firmly by its baſis to rocks or other ſolid ſubſtances, having a delatable apex hooked within. The mouth is furniſhed with crooked teeth, the roſtrum cylindrical and radiated. There are five ſpecies, ſome of which make a beautiful appearance, and are called *Animal Flowers*, *Sea Anemonies*, and *Urtica Marina*. See ANIMAL *Flower*.

Progreſſive motion in theſe creatures is ſo ſlow, that it is difficult to perceive any, as they ſcarce advance the length of one inch in an hour. It would ſeem they do not all produce, when handled, the painful ſenſation which had acquired them the name of *ſea-nettles*.—They are viviparous, feed on ſhell fiſh, open their mouth more or leſs according to the ſize of the prey they have to deal with, and then reject the ſhell through the ſame aperture. When the mouth is open, all the tentacula of the actinia may be ſeen, reſembling in that ſituation a full-blown flower, which has given it the denomination of the *flower-fiſh*.

ACTIO, in Roman antiquities, an action at law in a court of juſtice. The formalities uſed by the Romans, in judicial actions, were theſe: If the difference failed to be made up by friends, the injured perſon proceeded *in jus reum vocare*, to ſummon the offending party to the court, who was obliged to go, or give bond for his appearance.

The offending party might be ſummoned into court *viva voce*, by the plaintiff himſelf meeting the defendant, declaring his intention to him, and commanding him to go before the magiſtrate and make his defence. If he would not go willingly, he might drag and force him along, unleſs he gave ſecurity for his appearance on ſome appointed day. If he failed to appear on the day agreed on, then the plaintiff, whenſoever he met him, might take him along with him by force, calling any bye-ſtanders to bear witneſs, by aſking them *viſne anteſtari;* the bye-ſtanders upon this turned their ear towards him in token of their conſent: To this Horace alludes in his Sat. againſt the impertinent, Lib. I. Sat. 9. See this further explained under the article ANTESTARI.

Both parties being met before the prætor, or other ſupreme magiſtrate preſiding in the court, the plaintiff propoſed the action to the defendant; in which he deſigned to proſecute him. This they termed *edere actionem;* and was commonly performed by writing it in a tablet, and offering it to the defendant, that he might ſee whether he had better ſtand the ſuit or compound.

In the next place came the *poſtulatio actionis*, or the plaintiff's petition to the prætor, for leave to proſecute the defendant in ſuch an action. The petition was granted by writing at the bottom of it *actionem do*, or refuſed by writing in the ſame manner *actionem non do*.

The petition being granted, the plaintiff *vadabatur reum*, i. e. obliged him to give ſureties for his appearance on ſuch a day in the court; and this was all that was done in public, before the day fixed upon for the trial.

In the mean time, the difference was often made up, either *tranſactione*, by letting the cauſe fall as dubious; or *pactione*, by compoſition for damages amongſt friends.

On the day appointed for hearing, the prætor ordered the ſeveral bills to be read, and the parties ſummoned by an *accenſus*, or beadle. See ACCENSI.

Upon the non-appearance of either party, the defaulter loſt his cauſe;—if they both appeared, they were ſaid *ſe ſtetiſſe;* and then the plaintiff proceeded *litem ſive actionem intendere*, i. e. to prefer his ſuit, which was done in a ſet form of words, varying according to the difference of the actions. After this the plaintiff deſired judgment of the prætor, that is, to be allowed a *judex* or *arbiter*, or elſe the *recuperatores* or *centumviri*. Theſe he requeſted for the hearing and deciding the buſineſs; but none of them could be deſired but by the conſent of both parties.

The prætor having aſſigned them their judges, defined and determined the number of witneſſes to be admitted, to hinder the protracting of the ſuit; and then the parties proceeded to give their caution, that the judgment, whatever it was, ſhould ſtand and be performed on both ſides. The judges took a ſolemn oath to be impartial; and the parties took the *juramentum calumniæ*. Then the trial began with the aſſiſtance of witneſſes, writings, &c. which was called *diſceptatio cauſæ*.

ACTION, in a general ſenſe, implies nearly the ſame thing with Act.—Grammarians, however, obſerve ſome diſtinction between *action* and *act*; the former being generally reſtricted to the common or ordinary tranſactions, whereas the latter is uſed to expreſs thoſe which are remarkable. Thus, we ſay it is a good *action* to comfort the unhappy; it is a generous *act* to deprive ourſelves of what is neceſſary, for their ſake. The wiſe man propoſes to himſelf an honeſt end in all his *actions*; a prince ought to mark every day of his life with ſome *act* of greatneſs. The abbé Girard makes a further diſtinction between the words *action* and *act*. The former, according to him, has more relation to the power that acts than the latter; whereas the latter has more relation to the effect produced than the former: and hence the one is properly the attribute of the other. Thus we may properly ſay, “ Be ſure to preſerve a preſence of mind in all your actions; and take care that they be all acts of equity.”

Action, in mechanics, implies either the effort which a body or power makes againſt another body or power, or the effect itſelf of that effort.

As it is neceſſary in works of this kind to have a particular regard to the common language of mechanics and philoſophers, we have given this double definition: but the proper ſignification of the term is the motion which a body really produces, or tends to produce, in another; that is, ſuch is the motion it would have produced, had nothing hindered its effect.

All power is nothing more than a body actually in motion, or which tends to move itſelf; that is, a body which would move itſelf if nothing oppoſed it. The action therefore of a body is rendered evident to us by its motion only; and conſequently we muſt not fix any other idea to the word action, than that of actual motion, or a ſimple tendency to motion. The famous queſtion relating to *vis viva*, and *vis mortua*, owes, in all probability, its exiſtence to an inadequate idea of the word action; for had Leibnitz and his followers obſerved, that the only preciſe and diſtinct idea we can give to the word force or action, reduces it to its effect, that is, to the motion it actually produces or tends to produce, they would never have made that curious diſtinction.

Quantity of Action, a name given by M. de Maupertuis, in the memoirs of the Pariſian Academy of Sciences for 1744, and thoſe of Berlin for 1746, to the product of the maſs of a body by the ſpace which it runs through, and by its celerity. He lays it down as a general law, “ that, in the changes made in the ſtate “ of a body, the quantity of action neceſſary to pro- “ duce ſuch a change, is the leaſt poſſible.” This principle he applies to the inveſtigation of the laws of refraction, of equilibrium, &c. and even to the ways of acting employed by the Supreme Being. In this manner M. de Maupertuis attempts to connect the metaphyſics of final cauſes with the fundamental truths of mechanics, to ſhow the dependence of the colliſion of both elaſtic and hard bodies upon one and the ſame law, which before had always been referred to ſeparate laws; and to reduce the laws of motion, and thoſe of equilibrium, to one and the ſame principle.

Action, in ethics, denotes the external ſigns or expreſſions of the ſentiments of a moral agent. See *Active Power, infra*.

Action, in poetry, the ſame with ſubject or fable. Critics generally diſtinguiſh two kinds, the principal and the incidental. The principal action is what is generally called the *fable*; and the incidental an *epiſode*. See Poetry, Part II.

Action, in oratory, is the outward deportment of the orator, or the accommodation of his countenance, voice, and geſture, to the ſubject of which he is treating. See Oratory, Part IV.

Action, in a theatrical ſenſe. See Declamation, Art. IV.

Action for the Pulpit. See Declamation, Art. I.

Action, in painting and ſculpture, is the attitude or poſition of the ſeveral parts of the face, body, and limbs of ſuch figures as are repreſented, and whereby they ſeem really to be actuated by paſſions. Thus we ſay, the action of ſuch a figure finely expreſſes the paſſions with which it is agitated: we alſo uſe the ſame expreſſion with regard to animals.

Action, in phyſiology, is applied to the functions of the body, whether vital, animal, or natural.

The *vital* functions, or actions, are thoſe which are abſolutely neceſſary to life, and without which there is no life, as the action of the heart, lungs, and arteries. On the action and reaction of the ſolids and fluids on each other, depend the vital functions. The pulſe and reſpiration are the external ſigns of life. Vital diſeaſes are all thoſe which hinder the influx of the venous blood into the cavities of the heart, and the expulſion of the arterial blood from the ſame.—The *natural* functions are thoſe which are inſtrumental in repairing the ſeveral loſſes which the body ſuſtains; for life is deſtructive of itſelf, its very offices occaſioning a perpetual waſte. The manducation of food, the deglutition and digeſtion thereof, alſo the ſeparation and diſtribution of the chyle and excrementitious parts, &c. are under the head of natural functions, as by theſe our aliment is converted into our nature. They are neceſſary to the continuance of our bodies.—The *animal* functions are thoſe which we perform at will, as muſcular motion, and all the voluntary actions of the body: they are thoſe which conſtitute the ſenſes of touch, taſte, ſmell, ſight, hearing; perception, reaſoning, imagination, memory, judgment, affections of the mind. Without any, or all of them, a man may live, but not ſo comfortably as with them.

Action, in commerce, is a term uſed abroad for a certain part or ſhare of a public company's capital ſtock. Thus, if a company has 400,000 livres capital ſtock, this may be divided into 400 actions, each conſiſting of 1000 livres. Hence a man is ſaid to have two, four, &c. actions, according as he has the property of two, four, &c. 1000 livres capital ſtock. The transferring of actions abroad is performed much in the ſame manner as ſtocks are in England. See Stocks.

Action, in law, is a demand made before a judge for obtaining what we are legally intitled to demand, and is more commonly known by the name of *law-ſuit* or *proceſs*. See Suit.

ACTIONARY, or Actioniſt, a proprietor of ſtock in a trading company.

ACTIONS, among merchants, ſometimes ſignify moveable effects; and we ſay the merchant's creditors have ſeized on all his actions, when we mean that they have taken poſſeſſion of all his active debts.

ACTIVE, denotes ſomething that communicates action or motion to another; in which acceptation it ſtands oppoſed to paſſive.

Active, in grammar, is applied to ſuch words as expreſs action; and is therefore oppoſed to paſſive. The active performs the action, as the paſſive receives it. Thus we ſay, a verb *active,* a conjugation *active,* &c. or an *active* participle.

Active Verbs, are ſuch as do not only ſignify doing, or acting; but have alſo nouns following them, to be the ſubject of the action or impreſſion: thus, *To love, to teach,* are verbs *active;* becauſe we can ſay, *To love a thing, to teach a man.* Neuter verbs alſo denote an action, but are diſtinguiſhed from active verbs, in that they cannot have a noun following them: ſuch are, *To ſleep, to go, &c.*—Some grammarians, however, make three kinds of active verbs: the *tranſitive,* where the action paſſes into a ſubject different from the agent; *reflected,* where the action returns upon the agent; and *reciprocal,* where the action turns mutually upon the two agents who produced it.

Active Power, in metaphyſics, the power of executing any work or labour; in contradiſtinction to *ſpeculative* powers,* or the powers of ſeeing, hearing, remembering, judging, reaſoning, &c.

The exertion of active power we call *action;* and as every action produces ſome change, ſo every change muſt be cauſed by ſome effect, or by the ceſſation of ſome exertion of power. That which produces a change by the exertion of its power, we call the *cauſe* of that change; and the change produced, the *effect* of that cauſe. See Metaphysics.

Active Principles, in chemiſtry, ſuch as are ſuppoſed to act without any aſſiſtance from others; as mercury, ſulphur, &c.

ACTIVITY, in general, denotes the power of acting, or the active faculty. See Active.

Sphere of Activity, the whole ſpace in which the virtue, power, or influence, of any object, is exerted.

ACTIUM (anc. geog.), a town ſituated on the coaſt of Acarnania, in itſelf inconſiderable, but famous for a temple of Apollo, a ſafe harbour, and an adjoining promontory of the ſame name, in the mouth of the Sinus Ambracius, over againſt Nicopolis, on the other ſide of the bay: it afterwards became more famous on account of Auguſtus's victory over Anthony and Cleopatra: and for quinquennial games inſtituted there, called *Actia* or *Ludi Actiaci.* Hence the epithet *Actius,* given to Apollo (Virgil). *Actiaca æra,* a computation of time from the battle of Actium. The promontory is now called *Capo di Figalo.*

ACTIUS, in mythology, a ſurname of Apollo, from Actium, where he was worſhipped.

ACTON, a town near London, where is a well that affords a purging water, which is noted for the pungency of its ſalt. This water is whitiſh, to the taſte it is ſweetiſh, with a mixture of the ſame bitter which is in the Epſom water. The ſalt of this water is not quite ſo ſoft as that of Epſom; and is more calcareous than it, being more of the nature of the ſalt of lime: for a quantity of the Acton water being boiled high, on being mixed with a ſolution of ſublimate in pure water, threw down a yellow ſediment. The ſalt of the Acton water is more nitrous than that of Epſom; it ſtrikes a deep red, or purple, with the tincture of logwood in brandy, as is uſual with nitrous ſalts; it does not precipitate ſilver out of the ſpirit of nitre, as common ſalt does: 1½ ℔. of this water yields 48 grains of ſalt.

ACTOR, in general, ſignifies a perſon who acts or performs ſomething.

Actor, among Civilians, the proctor or advocate in civil courts or cauſes: as, *Actor eccleſiæ* has been ſometimes uſed for the advocate of the church; *actor dominicus* for the lord's attorney; *actor villæ,* the ſteward or head bailiff of a village.

Actor, in the drama, is a perſon who repreſents ſome part or character upon the theatre. The drama conſiſted originally of nothing more than a ſimple chorus, who ſung hymns in honour of Bacchus; ſo that the primitive actors were only ſingers and muſicians. Theſpis was the firſt that, in order to eaſe this unformed chorus, introduced a declaimer, who repeated ſome heroic or comic adventure. Æſchylus, finding a ſingle perſon tireſome, attempted to introduce a ſecond, and changed the ancient recitals into dialogues. He alſo dreſſed his actors in a more majeſtic manner, and introduced the cothurnus or buſkin. Sophocles added a third, in order to repreſent the various incidents in a more natural manner; and here the Greeks ſtopped, at leaſt we do not find in any of their tragedies above three perſons in the ſame ſcene. Perhaps they looked upon it as a rule of the dramatic poem, never to admit more than three ſpeakers at a time on the ſtage: a rule which Horace has expreſſed in the following verſe:

Nec quarta loqui perſona laboret.

This, however, did not prevent their increaſing the number of actors in comedy. Before the opening of a play, they named their actors in full theatre, together with the parts they were to perform. The ancient actors were maſked, and obliged to raiſe their voice extremely, in order to make themſelves heard by the innumerable crowd of people who filled the amphitheatres: they were accompanied with a player on the flute, who played a prelude, gave them the tone, and played while they declaimed. Horace ſpeaks of a kind of ſecondary actors, in his time, whoſe buſineſs was to imitate the firſt; and leſſen themſelves, to become better foils to their principals.

The moderns have introduced an indefinite number of actors upon the ſtage. This heightens the trouble and diſtreſs that ſhould reign there, and makes a diverſity, in which the ſpectator is ſure to be intereſted.

Actors were highly honoured at Athens. At Rome they were deſpiſed, and not only denied all rank among the citizens, but even when any citizen appeared upon the ſtage he was expelled his tribe and deprived of the right of ſuffrage by cenſors. Cicero, indeed, eſteems the talents of Roſcius: but he values his virtues ſtill more; virtues which diſtinguiſhed him ſo remarkably above all others of his profeſſion, that they ſeemed to have excluded him from the theatre. The French have, in this reſpect, adopted the ideas of the Romans; and the Engliſh thoſe of the Greeks.

Actor, the name of ſeveral perſons in fabulous hiſtory.

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* Dr Reid *on the Active Powers of Man,* p. 12.

ſtory. One *Actor* among the Aurunci is deſcribed by Virgil as an hero of the firſt rank. *Æn.* xii.

ACTORUM TABULÆ, in antiquity, were tables inſtituted by Servius Tullius, in which the births of children were regiſtered. They were kept in the treaſury of Saturnus.

ACTRESS, in a general ſenſe, a female who acts or performs ſomething.

ACTRESS, in the drama, a female perfomer. Women actors were unknown to the ancients, among whom men always performed the female character; and hence one reaſon for the uſe of maſks among them.

Actreſſes are ſaid not to have been introduced on the Engliſh ſtage till after the reſtoration of king Charles II. who has been charged with contributing to the corruption of our manners by importing this uſage from abroad. But this can be but partly true: the queen of James I. acted a part in a paſtoral; and Prynn, in his Hiſtriomaſtix, ſpeaks of women actors in his time as whores; which was one occaſion of the ſevere proſecution brought againſt him for that book.

There are ſome very agreeable and beautiful talents, of which the poſſeſſion commands a certain ſort of admiration; but of which the exerciſe for the ſake of gain is conſidered, whether from reaſon or prejudice, as a ſort of public proſtitution. The pecuniary recompence, therefore, of thoſe who exerciſe them in this manner, muſt be ſufficient, not only to pay for the time, labour, and expence of acquiring the talents, but for the diſcredit which attends the employment of them as the means of ſubſiſtence. The exorbitant rewards of players, opera-ſingers, opera-dancers, &c. are founded upon thoſe two principles; the rarity and beauty of the talents, and the diſcredit of employing them in this manner. It ſeems abſurd at firſt ſight that we ſhould deſpiſe their perſons, and yet reward their talents with the moſt profuſe liberality. While we do the one, however, we muſt of neceſſity do the other. Should the public opinion or prejudice ever alter with regard to ſuch occupations, their pecuniary recompence would quickly diminiſh. More people would apply to them, and the competition would quickly reduce the price of their labour. Such talents, though far from being common, are by no means ſo rare as is imagined. Many people poſſeſs them in great perfection, who diſdain to make this uſe of them; and many more are capable of acquiring them, if any thing could be made honourably by them.

ACTUAL, ſomething that is real and effective, or that exiſts truly and abſolutely. Thus philoſophers uſe the terms *actual* heat, *actual* cold, &c. in oppoſition to *virtual* or *potential*. Hence, among phyſicians, a red-hot iron, or fire, is called an *actual* cautery; in diſtinction from cauteries, or cauſtics, that have the power of producing the ſame effect upon the animal ſolids as actual fire, and are called *potential* cauteries. Boiling water is actually hot; brandy, producing heat in the body, is potentially hot, though of itſelf cold.

ACTUAL Sin, that which is committed by the perſon himſelf; in oppoſition to *original* ſin, or that which he contracted from being a child of Adam.

ACTUARIÆ NAVES, a kind of ſhips among the Romans, chiefly deſigned for ſwift ſailing.

ACTUARIUS, a celebrated Greek phyſician, of the 13th century, and the firſt Greek author who has treated of mild purgatives, ſuch as caſſia, manna, ſena, &c. His works were printed in one volume folio, by Henry Stephens, in 1567.

ACTUARIUS, or ACTARIUS, a notary or officer appointed to write the acts or proceedings of a court, or the like. In the Eaſtern Empire, the actuarii were properly officers who kept the military accounts, received the corn from the *ſuſceptores* or ſtore-keepers, and delivered it to the ſoldiers.

ACTUATE, to bring into act, or put a thing in action. Thus an agent is ſaid, by the ſchoolmen, to *actuate* a power, when it produces an act in a ſubject. And thus the mind may be ſaid to *actuate* the body.

ACTUS, in ancient architecture, a meaſure in length equal to 120 Roman feet. In ancient agriculture, the word ſignified the length of one furrow, or the diſtance a plough goes before it turns.

ACTUS Minimus, was a quantity of land 120 feet in length, and four in breadth.

ACTUS Major, or *ACTUS Quadratus*, a piece of ground in a ſquare form, whoſe ſide was equal to 120 feet, equal to half the jugerum.

ACTUS Intervicenalis, a ſpace of ground four feet in breadth, left between the lands as a path or way.

ACUANITIES, in eccleſiaſtical hiſtory, the ſame with thoſe called more frequently MANICHEES. They took the name from Acua, a diſciple of Thomas one of the twelve apoſtles.

ACULEATE, or ACULEATI, a term applied to any plant or animal armed with prickles.

ACULEI, the prickles of animals or of plants.

ACULER, in the manege, is uſed for the motion of a horſe, when, in working upon volts, he does not go far enough forward at every time or motion, ſo that his ſhoulders embrace or take in too little ground, and his croupe comes too near the centre of the volt. Horſes are naturally inclined to this fault in making demi-volts.

ACUMINA, in antiquity, a kind of military omen, moſt generally ſuppoſed to have been taken from the points or edges of darts, ſwords, or other weapons.

ACUNA (Chriſtopher de), a Spaniſh Jeſuit, born at Burgos. He was admitted into the ſociety in 1612, being then but 15 years of age. After having devoted ſome years to ſtudy, he went to America, where he aſſiſted in making converts in Chili and Peru. In 1640, he returned to Spain, and gave the king an account how far he had ſucceeded in the commiſſion he had received to make diſcoveries on the river of the Amazons; and the year following he publiſhed a deſcription of this river, at Madrid. Acuna was ſent to Rome, as procurator of his province. He returned to Spain with the title of Qualificator of the Inquiſition; but ſoon after embarked again for the Weſt-Indies, and was at Lima in 1675, when father Southwell publiſhed at Rome the Bibliotheque of the Jeſuit writers. Acuna's work is intitled, *Nuevo deſcubrimento del gran rio de las Amazonas*; *i. e.* "A new diſcovery of the great river of the Amazons." He was ten months together upon this river, having had inſtructions to inquire into every thing with the greateſt exactneſs, that his majeſty might thereby be enabled to render the navigation more eaſy and commodious. He went aboard a ſhip at Quito with Peter Texiera, who had already been ſo far up the river, and was therefore thought a proper perſon to accompany him in this expedition. They embarked in February 1639, but did not arrive at Para till the December following. It is thought that the revolutions of Portugal, by which the Spaniards loſt all Braſil, and the colony of Para at the mouth of the river of the Amazons, were the cauſe that the relation of this Jeſuit was ſuppreſſed; for as it could not be of any advantage to the Spaniards, they were afraid it might prove of great ſervice to the Portugueſe. The copies of this work became extremely ſcarce, ſo that the publiſhers of the French tranſlation at Paris aſſerted, that there was not one copy of the original extant, excepting one in the poſſeſſion of the tranſlator, and, perhaps, that in the Vatican library. M. de Gomberville was the author of this tranſlation: it was publiſhed after his death, with a long diſſertation. An account of the original may be ſeen in the Paris Journal, in that of Leipſic, and in Chevereau's Hiſtory of the World.

ACUPUNCTURE, the name of a ſurgical operation among the Chineſe and Japaneſe, which is performed by pricking the part affected with a ſilver needle. They employ this operation in headachs, lethargies, convulſions, colics, &c.

ACUS, in ichthyology, the trivial name of a ſpecies of ſyngnathus. See Syngnathus.

ACUSIO colonia, now Ancone, according to Holſtenius, between Orange and Valence, near Montelimart, on the banks of the Rhone.

ACUTE, an epithet applied to ſuch things as terminate in a ſharp point or edge. And in this ſenſe it ſtands oppoſed to obtuſe.

Acute Angle, in geometry, is that which is leſs than a right angle, or which does not ſubtend 90 degrees.

Acute-angled Triangle, is a triangle whoſe three angles are all acute.

Acute-angled Cone is, according to the ancients, a right cone, whoſe axis makes an acute angle with its ſide.

Acute, in muſic, is applied to a ſound or tone that is ſharp or high, in compariſon of ſome other tone. In this ſenſe, *acute* ſtands oppoſed to *grave*.

Acute Accent. See Accent.

Acute Diſeaſes, ſuch as come ſuddenly to a criſis. This term is uſed for all diſeaſes which do not fall under the head of chronic diſeaſes.

ACUTIATOR, in writers of the barbarous ages, denotes a perſon that whets or grinds cutting inſtruments; called alſo in ancient gloſſaries, *acutor*, ακουντης, *ſamiarius*, *coharius*, &c. In the ancient armies there were acutiators, a kind of ſmiths, retained for whetting or keeping the arms ſharp.

AD, a Latin prepoſition, originally ſignifying *to*, and frequently uſed in compoſition both with and without the *d*, to expreſs the relation of one thing to another.

Ad Beſtias, in antiquity, is the puniſhment of criminals condemned to be thrown to wild beaſts.

Ad Hominem, in logic, a kind of argument drawn from the principles or prejudices of thoſe with whom we argue.

Ad Ludos, in antiquity, a ſentence upon criminals among the Romans, whereby they were condemned to entertain the people by fighting either with wild beaſts, or with one another, and thus executing juſtice upon themſelves.

Ad Metalla, in antiquity, the puniſhment of ſuch criminals as were condemned to the mines, among the Romans; and therefore called *Metallici*.

Ad Valorem, a term chiefly uſed in ſpeaking of the duties or cuſtoms paid for certain goods: The duties on ſome articles are paid by the number, weight, meaſure, tale, &c.; and others are paid *ad valorem*, that is, according to their value.

ADAGE, a proverb, or ſhort ſentence, containing ſome wiſe obſervation or popular ſaying. Eraſmus has made a very large and valuable collection of the Greek and Roman adages; and Mr Ray has done the ſame with regard to the Engliſh. We have alſo Kelly's collection of Scots Proverbs.

ADAGIO, in muſic. Adverbially, it ſignifies *ſoftly*, *leiſurely*; and is uſed to denote the ſloweſt of all times. Uſed ſubſtantively, it ſignifies a ſlow movement. Sometimes this word is repeated, as *adagio, adagio*, to denote a ſtill greater retardation in the time of the muſic.

ADALIDES, in the Spaniſh policy, are officers of juſtice, for matters touching the military forces. In the laws of king Alphonſus, the adalides are ſpoken of as officers appointed to guide and direct the marching of the forces in time of war. Lopez repreſents them as a ſort of judges, who take cogniſance of the differences ariſing upon excurſions, the diſtribution of plunder, &c.

ADAM, the firſt of the human race, was formed by the Almighty on the ſixth day of the creation. His body was made of the duſt of the earth; after which, God animated or gave it life, and Adam then became a rational creature.—His heavenly Parent did not leave his offspring in a deſtitute ſtate to ſhift for himſelf; but planted a garden, in which he cauſed to grow not only every tree that was proper for producing food, but likewiſe ſuch as were agreeable to the eye, or merely ornamental. In this garden were aſſembled all the brute creation; and, by their Maker, cauſed to paſs before Adam, who gave all of them names, which were judged proper by the Deity himſelf.—In this review, Adam found none for a companion to himſelf. This ſolitary ſtate was ſeen by the Deity to be attended with ſome degree of unhappineſs; and therefore he threw Adam into a deep ſleep, in which condition he took a rib from his ſide, and healing up the wound formed a woman of the rib he had taken out. On Adam's awaking, the woman was brought to him; and he immediately knew her to be one of his own ſpecies, called her his bone and his fleſh, giving her the name of *woman* becauſe ſhe was taken out of man.

The firſt pair being thus created, God gave them authority over the inferior creation, commanding them to ſubdue the earth, alſo to increaſe and multiply and fill it. They were informed of the proper food for the beaſts and for them; the graſs or green herbs, being appointed for beaſts; and fruits, or ſeeds, for man. Their proper employment alſo was aſſigned them; namely, *to dreſs the garden and to keep it*.

Though Adam was thus highly favoured and inſtructed

ted by his Maker, there was a ſingle tree, which grew in the middle of the garden, of the fruit of which they were not allowed to eat; being told, that they ſhould ſurely die in the day they eat of it. This tree was named, *the Tree of the Knowledge of Good and Evil.* This prohibition, however, they ſoon broke through. The woman having entered into converſation with *the Serpent*, was by him perſuaded, that by eating of the tree ſhe ſhould become as wiſe as God himſelf: and accordingly, being invited by the beauty of the fruit, and its deſirable property of imparting wiſdom, ſhe plucked and eat; giving her huſband of it at the ſame time, who did likewiſe eat.

Before this tranſgreſſion of the divine command, Adam and his wife had no occaſion for clothes, neither had they any ſenſe of ſhame; but immediately on eating the forbidden fruit, they were aſhamed of being naked, and made aprons of fig-leaves for themſelves. On hearing the voice of God in the garden, they were terrified, and hid themſelves: but being queſtioned by the Deity, they confeſſed what they had done, and received ſentence accordingly; the man being condemned to labour; the woman to ſubjection to her huſband, and to pain in child-bearing. They were now driven out of the garden, and their acceſs to it prevented by a terrible apparition. They had clothes given them by the Deity made of the ſkins of beaſts. In this ſtate Adam had ſeveral children; the names of only three of whom we are acquainted with, *viz.* Cain, Abel, and Seth. He died at the age of 930 years.

Theſe are all the particulars concerning Adam's life, that we have on divine authority: but a vaſt multitude of others are added by the Jews, Mahometans, and others; all of which muſt be at beſt conjectural; moſt of them, indeed, appear downright falſehoods or abſurdities. The curioſity of our readers, it is preſumed, will be ſufficiently gratified by the few which are here ſubjoined.

According to the Talmudiſts, when Adam was created, his body was of immenſe magnitude. When he ſinned, his ſtature was reduced to an hundred ells, according to ſome; to nine hundred cubits, according to others; who think this was done at the requeſt of the angels, who were afraid of ſo gigantic a creature. In the iſland of Ceylon is a mountain, called the *Peak* or mountain of Adam, from its being, according to the tradition of the country, the reſidence of our firſt parent. Here the print of his footſteps, above two palms in length, are ſtill pointed out.

Many reveries have been formed concerning the perſonal beauty of Adam. That he was a handſome well-ſhaped man is probable; but ſome writers, not content with this, affirm, that God, intending to create man, clothed Himſelf with a perfectly beautiful human body, making this his model in the formation of the body of Adam.

Nor has the imagination been leſs indulged concerning the formation of the human ſpecies male and female.—It would be endleſs to recount all the whimſies that have been wrote on this ſubject; but as Mad. Bourignon has made a conſiderable figure in the *religious*, or rather *ſuperſtitious* world, we cannot help inſerting ſome of her opinions concerning the firſt man, which are peculiarly marvellous. According to the *revelations* of this lady, Adam before his fall poſſeſſed in himſelf the principles of both ſexes, and the virtue or power of producing his like, without the concurrent aſſiſtance of woman. The diviſion into two ſexes, ſhe imagined *, was a conſequence of man's ſin; and now, ſhe obſerves, mankind are become ſo many *monſters in nature*, being much leſs perfect in this reſpect than plants or trees, who are capable of producing their like alone, and without pain or miſery. She even imagined, that, being in an ecſtaſy, ſhe ſaw the figure of Adam before he fell, with the manner how, by himſelf, he was capable of procreating other men. "God," ſays ſhe, "repreſented to my mind the beauty of the firſt world, and the manner how he had drawn it from the chaos: every thing was bright, tranſparent, and darted forth light and ineffable glory. The body of Adam was purer and more tranſparent than cryſtal, and vaſtly fleet; through his body were ſeen veſſels and rivulets of light, which penetrated from the inward to the outward parts, through all his pores. In ſome veſſels ran fluids of all kinds and colours, vaſtly bright, and quite diaphanous. The moſt raviſhing harmony aroſe from every motion; and nothing reſiſted, or could annoy, him. His ſtature was taller than the preſent race of men; his hair was ſhort, curled, and of a colour inclining to black; his upper lip covered with ſhort hair: and inſtead of the beſtial parts which modeſty will not allow us to name, he was faſhioned as our bodies will be in the life eternal, which I know not whether I dare reveal. In that *region* his noſe was formed after the manner of a *face*, which diffuſed the moſt delicious fragrancy and perfumes; whence alſo men were to iſſue, all whoſe principles were inherent in him; there being in his belly a veſſel, where little eggs were formed; and a ſecond veſſel filled with a fluid, which impregnated thoſe eggs: and when man heated himſelf in the love of God, the deſire he had that other creatures ſhould exiſt beſides himſelf, to praiſe and love God, cauſed the fluid abovementioned (by means of the fire of the love of God) to drop on one or more of theſe eggs, with inexpreſſible delight; which being thus impregnated, iſſued, ſome time after, out of man, by this canal †, in the ſhape of an egg, whence a perfect man was hatched by inſenſible degree. Woman was formed by taking out of Adam's ſides the veſſels that contained the eggs; which ſhe ſtill poſſeſſes, as is diſcovered by anatomiſts."

Many others have believed, that Adam at his firſt creation was both male and female: others, that he had two bodies joined together at the ſhoulders, and their faces looking oppoſite ways like thoſe of Janus. Hence, ſay theſe, when God created Eve, he had no more to do than to ſeparate the two bodies from one another ‡. Of all others, however, the opinion of Paracelſus ſeems the moſt ridiculous §. *Negabat primos parentes ante lapſum habuiſſe partes generationi hominis neceſſarias; credebat poſtea acceſſiſſe, ut ſtrumam gutturi.*

Extravagant things are aſſerted concerning Adam's knowledge. It is very probable that he was inſtructed by the Deity how to accompliſh the work appointed him, *viz.* to dreſs the garden, and keep it from being deſtroyed by the brute creatures; and it is alſo probable that he had likewiſe every piece of knowledge communicated to him that was either neceſſary or pleaſing: but that he was acquainted with geometry, mathematics, rhetoric, poetry, painting, ſculpture, *&c.* is too ridiculous to be credited by any ſober perſon. Some

* Preface to a book intitled, *Le nouveau ciel et la nouvelle terre*, Amſt. 1679.

† *i. e.* the *naſal* canal, ſituated as above deſcribed.

§ See *Androgynes.*

|| Paracelſus *apud* Voſſium *de philoſophia*, c. ix. p. 71.

rabbies, indeed, have contented themſelves with equalling Adam's knowledge to that of Moſes and Solomon; while others, again, have maintained that he excelled the angels themſelves. Several Chriſtians ſeem to be little behind theſe Jews in the degree of knowledge they aſcribe to Adam; nothing being hid from him, according to them, except contingent events relating to futurity. One writer indeed (Pinedo) excepts politics; but a Carthuſian friar, having exhauſted, in favour of Ariſtotle, every image and compariſon he could think of, at laſt aſſerts that Ariſtotle's knowledge was as extenſive as that of *Adam*.—In conſequence of this ſurpriſing knowledge with which Adam was endued, he is ſuppoſed to have been a conſiderable author. The Jews pretend that he wrote a book on the creation, and another on the Deity. Some rabbies aſcribe the 92d pſalm to Adam; and in ſome manuſcripts the Chaldee title of this pſalm expreſsly declares that this is the ſong of praiſe which the firſt man repeated for the ſabbath-day.

Various conjectures have been formed concerning the place where man was firſt created, and where the garden of Eden was ſituated; but none of theſe have any ſolid foundation. The Jews tell us, that Eden was ſeparated from the reſt of the world by the ocean; and that Adam, being baniſhed therefrom, walked acroſs the ſea, which he found every way fordable, by reaſon of his enormous ſtature*. The Arabians imagined paradiſe to have been in the air; and that our firſt parents were thrown down from it on their tranſgreſſion, as Vulcan is ſaid to have been thrown down headlong from heaven by Jupiter.

Strange ſtories are told concerning Adam's children. That he had none in the ſtate of innocence, is certain from ſcripture; but that his marriage with Eve was not conſummated till after the fall, cannot be proved from thence. Some imagine, that, for many years after the fall, Adam denied himſelf the connubial joys by way of penance; others, that he cohabited with another woman, whoſe name was Lilith. The Mahometans tell us, that our firſt parents having been thrown headlong from the celeſtial paradiſe, Adam fell upon the iſle of Serendib, or Ceylon, in the Eaſt-Indies; and Eve on Iodda, a port of the Red Sea, not far from Mecca. After a ſeparation of upwards of 200 years, they met in Ceylon, where they multiplied: according to ſome Eve had twenty, according to others only eight, deliveries; bringing forth at each time twins, a male and female, who afterwards married. The Rabbins imagine that Eve brought forth Cain and Abel at a birth; that Adam wept for Abel an hundred years in the valley of tears near Hebron, during which time he did not cohabit with his wife; and that this ſeparation would probably have continued longer, had it not been forbid by the angel Gabriel. The inhabitants of Ceylon affirm, that the ſalt lake on the mountain of Colembo conſiſts wholly of the tears which Eve for one hundred years together ſhed becauſe of Abel's death.

Some of the Arabians tell us, that Adam was buried near Mecca on Mount Abukobeis; others, that Noah, having laid his body in the ark, cauſed it to be carried after the deluge to Jeruſalem by Melchiſedek the ſon of Shem: of this opinion are the eaſtern Chriſtians; but the Perſians affirm that he was interred in the iſle of Serendib, where his corps was guarded by lions at the time the giants warred upon one another.—St Jerom imagined that Adam was buried at Hebron; others, on Mount Calvary. Some are of opinion that he died on the very ſpot where Jeruſalem was afterwards built; and was buried on the place where Chriſt ſuffered, that ſo his bones might be ſprinkled with the Saviour's blood!!!

Adam (Melchior) lived in the 17th century. He was born in the territory of Grotkaw in Sileſia, and educated in the college of Brieg, where the dukes of that name, to the utmoſt of their power, encouraged learning and the reformed religion as profeſſed by Calvin. Here he became a firm Proteſtant; and was enabled to purſue his ſtudies by the liberality of a perſon of quality, who had left ſeveral exhibitions for young ſtudents. He was appointed rector of a college at Heidelberg, where he publiſhed his firſt volume of illuſtrious men in the year 1615. This volume, which conſiſted of philoſophers, poets, writers on polite literature, and hiſtorians, &c. was followed by three others; that which treated of divines was printed in 1619; that of the lawyers came next; and, finally, that of the phyſicians: the two laſt were publiſhed in 1620. All the learned men, whoſe lives are contained in theſe four volumes, lived in the 16th, or beginning of the 17th century, and are either Germans or Flemings; but he publiſhed in 1618 the lives of twenty divines of other countries in a ſeparate volume. All his divines are Proteſtants. The Lutherans were not pleaſed with him, for they thought him partial; nor will they allow his work to be a proper ſtandard whereby to judge of the learning of Germany. He wrote other works beſides his lives, and died in 1622.

Adam's Apple, a name given to a ſpecies of Citrus.

Adam's Needle. See Yucca.

Adam's Peak, a high mountain of the Eaſt Indies, in the iſland of Ceylon, on the top of which they believe the firſt man was created. See Adam.

Adam, or Adom, a town in the Peræa, or on the other ſide the Jordan, over-againſt Jericho, where the Jordan began to be dried up on the paſſage of the Iſraelites; (Joſhua.)

ADAMA, or Admah, one of the towns that were involved in the deſtruction of Sodom; (Moſes.)

ADAMANT, a name ſometimes given to the diamond. (See Diamond.) It is likewiſe applied to the ſcoriæ of gold, the magnet, &c.

ADAMIC earth, a name given to common red clay, alluding to that ſpecies of earth of which the firſt man is ſuppoſed to have been made.

ADAMI pomum, in anatomy, a protuberance in the fore-part of the throat, formed by the os hyoides. It is thought to be ſo called upon a ſtrange conceit, that a piece of the forbidden apple, which Adam eat, ſtuck by the way, and occaſioned it.

ADAMITES, in eccleſiaſtical hiſtory, the name of a ſect of ancient heretics, ſuppoſed to have been a branch of the Baſilidians and Carpocratians.

Epiphanius tells us, that they were called Adamites from their pretending to be re-eſtabliſhed in the ſtate of innocence, and to be ſuch as Adam was at the moment of his creation, whence they ought to imitate him in his nakedneſs. They deteſted marriage; maintaining, that the conjugal union would never have taken place upon earth had ſin been unknown.

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* This is juſt the picture of the Orion or Polyphemus of the poets. *Æneid.* iii. 663. 664. x. 763.

This obſcure and ridiculous ſect did not at firſt laſt long; but it was revived, with additional abſurdities, in the twelfth century, by one Tandamus, ſince known by the name of *Tanchelin*, who propagated his errors at Antwerp, in the reign of the emperor Henry V. He maintained, that there ought to be no diſtinction between prieſts and laymen, and that fornication and adultery were meritorious actions. Tanchelin had a great number of followers, and was conſtantly attended by 3000 of theſe profligates in arms. His ſect did not, however, continue long after his death: but another appeared under the name of *Turlupins*, in Savoy and Dauphiny, where they committed the moſt brutal actions in open day.

About the beginning of the fifteenth century, one Picard, a native of Flanders, ſpread theſe errors in Germany and Bohemia, particularly in the army of the famous Ziſca, notwithſtanding the ſevere diſcipline he maintained. Picard pretended that he was ſent into the world as a new Adam, to re-eſtabliſh the law of nature; and which, according to him, conſiſted in expoſing every part of the body, and having all the women in common. This ſect found alſo ſome partizans in Poland, Holland, and England: they aſſembled in the night; and it is aſſerted, that one of the fundamental maxims of their ſociety was contained in the following verſe:

Jura, perjura, ſecretum prodere noli.

ADAMUS, the philoſopher's ſtone is ſo called by alchemiſts; they ſay it is an animal, and that it has carried its inviſible *Eve* in its body, ſince the moment they were united by the Creator.

ADAMSHIDE, a diſtrict in the circle of Raſtenburg, belonging to the king of Pruſſia, which, with Dombroſken, was bought, in 1737, for 42,000 dollars.

ADAMSON (Patrick) a Scottiſh prelate, archbiſhop of St Andrews. He was born in the year 1543 in the town of Perth, where he received the rudiments of his education; and afterwards ſtudied philoſophy, and took his degree of maſter of arts at the univerſity of St Andrews. In the year 1566, he ſet out for Paris, as tutor to a young gentleman. In the month of June of the ſame year, Mary queen of Scots being delivered of a ſon, afterwards James VI. of Scotland and Firſt of England, Mr Adamſon wrote a Latin poem on the occaſion. This proof of his loyalty involved him in ſome difficulties, having been confined in France for ſix months; nor would he have eaſily got off, had not Queen Mary, and ſome of the principal nobility, intereſted themſelves in his behalf. As ſoon as he recovered his liberty, he retired with his pupil to Bourges. He was in this city during the maſſacre at Paris; and the ſame perſecuting ſpirit prevailing amongſt the catholics at Bourges as at the metropolis, he lived concealed for ſeven months in a public houſe, the maſter of which, upwards of 70 years of age, was thrown from the top thereof, and had his brains daſhed out, for his charity to heretics. Whilſt Mr Adamſon lay thus in his ſepulchre, as he called it, he wrote his Latin poetical verſion of the Book of Job, and his Tragedy of Herod in the ſame language. In the year 1573, he returned to Scotland; and, having entered into holy orders, became miniſter of Paiſley. In the year 1575, he was appointed one of the commiſſioners, by the general aſſembly, to ſettle the juriſdiction and policy of the church; and the following year he was named, with Mr David Lindſay, to report their proceedings to the earl of Mortoun, then regent. About this time the earl made him one of his chaplains; and, on the death of biſhop Douglas, promoted him to the archiepiſcopal ſee of St Andrew's, a dignity which brought upon him great trouble and uneaſineſs: for now the clamour of the preſbyterian party roſe very high againſt him, and many inconſiſtent abſurd ſtories were propagated concerning him. Soon after his promotion, he publiſhed his catechiſm in Latin verſe, a work highly approved even by his enemies; but, nevertheleſs, they ſtill continued to perſecute him with great violence. In 1578, he ſubmitted himſelf to the general aſſembly, which procured him peace but for a very little time; for, the year following, they brought freſh accuſations againſt him. In the year 1582, being attacked with a grievous diſeaſe, in which the phyſicians could give him no relief, he happened to take a ſimple medicine from an old woman, which did him ſervice. The woman, whoſe name was Aliſon Pearſon, was thereupon charged with witchcraft, and committed to priſon, but eſcaped out of her confinement; however, about four years afterwards, ſhe was again found and burnt for a witch. In 1583, king James came to St Andrew's; and the archbiſhop being much recovered, preached before him, and diſputed with Mr Andrew Melvil, in preſence of his Majeſty, with great reputation, which drew upon him freſh calumny and perſecution. The king, however, was ſo well pleaſed with him, that he ſent him ambaſſador to Queen Elizabeth, at whoſe court he reſided for ſome years. His conduct, during his embaſſy, has been variouſly reported by different authors. Two things he principally laboured, *viz.* the recommending the king his maſter to the nobility and gentry of England, and the procuring ſome ſupport for the epiſcopal party in Scotland. By his eloquent preaching, he drew after him ſuch crowds of people, and raiſed in their minds ſuch a high idea of the young king his maſter, that queen Elizabeth forbade him to enter the pulpit during his ſtay in her dominions. In 1584, he was recalled, and ſat in the parliament held in Auguſt at Edinburgh. The Preſbyterian party was ſtill very violent againſt the archbiſhop. A provincial ſynod was held at St Andrew's in April 1586: the archbiſhop was here accuſed and excommunicated: he appealed to the king and the ſtates, but this availed him little; for the mob being excited againſt him, he durſt ſcarce appear in public. At the next general aſſembly, a paper being produced, containing the archbiſhop's ſubmiſſion, he was abſolved from the excommunication. In 1588, freſh accuſations were brought againſt him. The year following, he publiſhed the Lamentations of the prophet Jeremiah in Latin verſe; which he dedicated to the king, complaining of his hard uſage. In the latter end of the ſame year, he publiſhed a tranſlation of the Apocalypſe, in Latin verſe; and a copy of Latin verſes, addreſſed alſo to his Majeſty, when he was in great diſtreſs. The king, however, was ſo far from giving him aſſiſtance, that he granted the revenue of his ſee to the duke of Lennox; ſo that the remaining part of this prelate's life was very wretched, he having hardly ſubſiſtence for his family. He died in 1591.

ADANA, a town of Aſia, in Natolia, and in the province of Carmania. It is ſeated on the river Choquen; on the banks of which ſtands a ſtrong little caſtle built on a rock. It has a great number of beautiful fountains brought from the river by means of water-works. Over the river there is a ſtately bridge of fifteen arches, which leads to the water-works. The climate is very pleaſant and healthy, and the winter mild and ſerene: but the ſummer is ſo hot as to oblige the principal inhabitants to retire into the neighbouring mountains, where they ſpend ſix months among ſhady trees and grottoes, in a moſt delicious manner. The adjacent country is rich and fertile, and produces melons, cucumbers, pomegranates, pulſe, and herbs of all ſorts, all the year round; beſides corn, wine, and fruits in their proper ſeaſon. It is 30 miles eaſt of Tarſus, on the road to Aleppo. E. long. 35. 42. N. lat. 38. 10.

ADANSONIA, Ethiopian Sour-gourd, Monkies-bread, or African Calabash-tree, a genus of the monodelphia order, belonging to the polyandria claſs of plants; the characters of which are: The *calyx* is a perianthium one-leav'd, half five-cleft, cup-form, (the diviſions revolute), deciduous: The *corolla* conſiſts of five petals, roundiſh, nerved, revolute, growing reciprocally with the claws and ſtamina: The *ſtamina* have numerous filaments, coaleſced beneath into a tube, and crowning it, expanding horizontally; the antheræ kidney-form, incumbent: The *piſtillum* has an egged germ; the ſtylus very long, tubular, variouſly intorted; the ſtigmata numerous (10) priſmatic, villous, ray-expanded: The *pericarpium* is an oval capſule, woody, not gaping, ten-celled, with farinaceous pulp, the partitions membranous: The *ſeeds* are numerous, kidney-ſhaped, rather bony, and involved in a friable pulp.

There is at preſent but one known ſpecies belonging to this genus, the Baobab, which is perhaps the largeſt production of the whole vegetable kingdom. It is a native of Africa.

The trunk is not above 12 or 15 feet high, but from 65 to 78 feet round. The loweſt branches extend almoſt horizontally; and as they are about 60 feet in length, their own weight bends their extremities to the ground, and thus form an hemiſpherical maſs of verdure of about 120 or 130 feet in diameter. The roots extend as far as the branches: that in the middle forms a pivot, which penetrates a great way into the earth; the reſt ſpread near the ſurface. The flowers are in proportion to the ſize of the tree; and are followed by an oblong fruit, pointed at both ends, about 10 inches long, five or ſix broad, and covered with a kind of greeniſh down, under which is a ligneous rind, hard and almoſt black, marked with rays which divide it lengthways into ſides. The fruit hangs to the tree by a pedicle two feet long and an inch diameter. It contains a whitiſh ſpungy juicy ſubſtance; with ſeeds of a brown colour, and ſhaped like a kidney-bean. The bark of this tree is nearly an inch thick, of an aſh-coloured grey, greaſy to the touch, bright, and very ſmooth: the outſide is covered with a kind of varniſh; and the inſide is green, ſpeckled with red. The wood is white, and very ſoft; the firſt ſhoots of the ear are green and downy.

The leaves of the young plants are entire, of an oblong form, about four or five inches long, and almoſt three broad towards the top, having ſeveral veins running from the middle rib; they are of a lucid green colour. As the plants advance in height, the leaves alter, and are divided into three parts, and afterwards into five lobes, which ſpread out in the ſhape of an hand. The tree ſheds its leaves in November, and new ones begin to appear in June. It flowers in July, and the fruit ripens in October and November. It is very common in Senegal, and the Cape de Verd iſlands; and is found 100 leagues up the country at Gulam, and upon the ſea-coaſt as far as Sierra Leona.

The age of this tree is perhaps no leſs remarkable than its enormous ſize. Mr Adanſon relates, that in a botanical excurſion to the Magdalene Iſlands, in the neighbourhood of Goree, he diſcovered ſome calabaſh-trees, from five to ſix feet diameter, on the bark of which were engraved or cut to a conſiderable depth a number of European names. Two of theſe names, which he was at the trouble to repair, were dated one the 14th, the other the 15th century. The letters were about ſix inches long, but in breadth they occupied a very ſmall part only of the circumference of the trunk: from whence he concluded they had not been cut when theſe trees were young. Theſe inſcriptions, however, he thinks ſufficient to determine pretty nearly the age which theſe calabaſh-trees may attain; for even ſuppoſing that thoſe in queſtion were cut in their early years, and that trees grew to the diameter of ſix feet in two centuries, as the engraved letters evince, how many centuries muſt be requiſite to give them a diameter of 25 feet, which perhaps is not the laſt term of their growth! The inſcribed trees mentioned by this ingenious Frenchman had been ſeen in 1555, almoſt two centuries before, by Thevet, who mentions them in the relation of his voyage to Terra Antarctica or Auſtralis. Adanſon ſaw them in 1749.

The virtues and uſes of this tree and its fruit are various. The negroes of Senegal dry the bark and leaves in the ſhaded air; and then reduce them to powder, which is of a pretty good green colour. This powder they preſerve in bags of linen or cotton, and call it *lillo*. They uſe it every day, putting two or three pinches of it into a meſs, whatever it happens to be, as we do pepper and ſalt: but their view is, not to give a reliſh to their food, but to preſerve a perpetual and plentiful perſpiration, and to attemper the too great heat of the blood; purpoſes which it certainly anſwers, as ſeveral Europeans have proved by repeated experiments, preſerving themſelves from the epidemic fever, which, in that country, deſtroys Europeans like the plague, and generally rages during the months of September and October, when, the rains having ſuddenly ceaſed, the ſun exhales the water left by them upon the ground, and fills the air with a noxious vapour. M. Adanſon, in that critical ſeaſon, made a light ptiſan of the leaves of the baobab, which he had gathered in the Auguſt of the preceding year, and had dried in the ſhade; and drank conſtantly about a pint of it every morning, either before or after breakfaſt, and the ſame quantity of it every evening after the heat of the ſun began to abate; he alſo ſometimes took the ſame quantity in the middle of the day, but this was only when he felt ſome ſymptoms of an approaching fever. By this precaution he preſerved himſelf, during the five years he reſided at Senegal, from the diarrhœa and fever, which are ſo fatal there, and which are, however, the only dangerous diſeaſes of the place; and other officers ſuffered very ſeverely, only one excepted, upon whom M. Adanſon prevailed to uſe this remedy, which for its ſimplicity was deſpiſed by the reſt. This ptiſan alone alſo prevents that heat of urine which is common in theſe parts, from the month of July to November, provided the perſon abſtains from wine.

The fruit is not leſs uſeful than the leaves and the bark. The pulp that envelopes the ſeeds has an agreeable acid taſte, and is eaten for pleaſure: it is alſo dried and powdered, and thus uſed medicinally in peſtilential fevers, the dyſentery, and bloody flux; the doſe is a drachm, paſſed through a fine ſieve, taken either in common water, or in an infuſion of the plantain. This powder is brought into Europe under the name of *terra ſigillata lemnia*. The woody bark of the fruit, and the fruit itſelf when ſpoiled, helps to ſupply the negroes with an excellent ſoap, which they make by drawing a ley from the aſhes, and boiling it with palm-oil that begins to be rancid.

The trunks of ſuch of theſe trees as are decayed, the negroes hollow out into burying places for their poets, muſicians, buffoons: perſons of theſe characters they eſteem greatly while they live, ſuppoſing them to derive their ſuperior talents from ſorcery or a commerce with demons; but they regard their bodies with a kind of horror when dead, and will not give them burial in the uſual manner, neither ſuffering them to be put into the ground, nor thrown into the ſea or any river, becauſe they imagine that the water would not then nouriſh the fiſh, nor the earth produce its fruits. The bodies ſhut up in theſe trunks become perfectly dry without rotting, and form a kind of mummies without the help of embalment.

The baobab is very diſtinct from the calabaſh-tree of America, with which it has been confounded by father Labat. See CRESCENTIA.

Culture. This tree is propagated from ſeeds, which are brought from the countries where they grow naturally. Being natives only of hot climates, the plants will not thrive in the open air in Britain, even in ſummer. The ſeeds are therefore to be ſown in pots, and plunged into a hot-bed, where the plants will appear in about ſix weeks, and in a ſhort time after be fit to tranſplant. They muſt then be planted each in a ſeparate pot, in light ſandy earth, and plunged into a hot-bed, ſhading them until they have taken root: after which they ſhould have freſh air admitted every day in warm weather: but muſt be ſparingly watered, as being apt to rot. They grow quickly for two or three years, but afterwards make little progreſs; the lower part of the ſtem then begins to ſwell, and put out lateral branches, inclining to a horizontal poſition, and covered with a light grey bark.——Some of this kind of plants were raiſed from ſeeds obtained from Grand Cairo by Dr William Sherard, in 1724, and were grown to the height of 18 feet; but were all deſtroyed by the ſevere froſt in 1740; after which they were unknown in Britain till the return of Mr Adanſon to Paris in 1754.

ADAPTERS, or ADOPTERS. See CHEMISTRY, (*Index.*)

ADAR, the name of a Hebrew month, anſwering to the end of February and beginning of March, the 12th of their ſacred, and 6th of their civil year. On the 7th day of it, the Jews keep a feaſt for the death of Moſes; on the 13th, they have the feaſt of Eſther; and on the 14th, they celebrate the feaſt of Purim, for their deliverance from Haman's conſpiracy.—As the lunar year, which the Jews followed in their calculations, is ſhorter than the ſolar by about 11 days, which at the end of three years make a month, they then intercalate a 13th month, which they call *Veadar*, or the *ſecond Adar*.

ADARCE, a kind of concreted ſalts found on reeds and other vegetables, and applied by the ancients as a remedy in ſeveral cutaneous diſeaſes.

ADARCON, in Jewiſh antiquity, a gold coin mentioned in ſcripture, worth about 15s. ſterling.

ADARME, in commerce, a ſmall weight in Spain, which is alſo uſed at Buenos-Aires, and in all Spaniſh America. It is the 16th part of an ounce, which at Paris is called the *demi-gros*. But the Spaniſh ounce is ſeven *per cent.* lighter than that of Paris. Stephens renders it in Engliſh by a *dram*.

ADATAIS, ADATIS, or ADATYS, in commerce, a muſlin or cotton-cloth, very fine and clear, of which the piece is ten French ells long, and three quarters broad. It comes from the Eaſt-Indies; and the fineſt is made at Bengal.

ADCORDABILIS DENARII, in old law books, ſignify money paid by the vaſſal to his lord, upon the ſelling or exchanging of a feud.

ADCRESCENTES, among the Romans, denoted a kind of ſoldiery, entered into the army, but not yet put on duty; from theſe the ſtanding forces were recruited. See ACCENSI.

ADDA, in geography, a river of Switzerland and Italy, which riſes in mount Braulio, in the country of the Griſons, and, paſſing through the Valteline, traverſes the lake Como and the Milaneſe, and falls into the Po, near Cremona.

ADDEPHAGIA, in medicine, a term uſed by ſome phyſicians, for gluttony, or a voracious appetite.

ADDER, in zoology, a name for the VIPER. See COLUBER.

ADDER-Bolts, or *Adder-flies*. See LIBELULLA.

Sea-ADDER, the Engliſh name of a ſpecies of SYNGNATHUS.

Water-ADDER, a name given to the COLUMBER *Natrix*.

ADDER-ſtung, is uſed in reſpect of cattle, when ſtung with any kind of venomous reptiles, as adders, ſcorpions, &c. or bit by a hedge-hog or ſhrew.—For the cure of ſuch bites, ſome uſe an ointment made of dragon's blood, with a little barley-meal, and the whites of eggs.

ADDER-Wort, or *Snakewood*. See POLYGONUM.

ADDEXTRATORES, in the court of Rome, the pope's mitre-bearers, ſo called, according to Ducange, becauſe they walk at the Pope's right-hand when he rides to viſit the churches.

ADDICE, or ADZE, a kind of crooked ax uſed by ſhip-wrights, carpenters, coopers, &c.

ADDICTI, in antiquity, a kind of ſlaves, among the Romans, adjudged to ſerve ſome creditor whom they could not otherwiſe ſatisfy, and whoſe ſlaves they became till they could pay or work out the debt.

ADDICTION, among the Romans, was the making

king over goods to another, either by ſale, or by legal ſentence; the goods ſo delivered were called *bona addicta*. Debtors were ſometimes delivered over in the ſame manner: and thence called *ſervi addicti*.

ADDICTIO IN DIEM, among the Romans, the adjudging a thing to a perſon for a certain price, unleſs by ſuch a day the owner, or ſome other, gave more for it.

ADDISON (Lancelot), ſon of Lancelot Addiſon a clergyman, was born at Mouldiſmeaburn, in the pariſh of Croſby Ravenſworth in Weſtmoreland, in the year 1632. He was educated at Queen's College, Oxford; and at the Reſtoration of king Charles II. accepted of the chaplainſhip of the garriſon of Dunkirk: but that fortreſs being delivered up to the French in 1662, he returned to England, and was ſoon after made chaplain to the garriſon of Tangier; where he continued ſeven years, and was greatly eſteemed. In 1670, he returned to England, and was made chaplain in ordinary to the king; but his chaplainſhip of Tangier being taken from him on account of his abſence, he found himſelf ſtraitened in his circumſtances, when he ſeaſonably obtained the rectory of Milſton in Wiltſhire, worth about 120l. *per annum*. He afterwards became a prebendary of Sarum; took his degree of doctor of divinity at Oxford; and in 1683 was made dean of Litchfield, and the next year archdeacon of Coventry. His life was exemplary; his converſation pleaſing, and greatly inſtructive; and his behaviour as a gentleman, a clergyman, and a neighbour, did honour to the place of his reſidence. He wrote, 1. A Short Narrative of the Revolutions of the Kingdoms of Fez and Morocco: 2. The preſent Hiſtory of the Jews: 3. A Diſcourſe on Catechiſing: 4. A Modeſt Plea for the Clergy: 5. An Introduction to the Sacrament: 6. The firſt State of Mahometiſm: and ſeveral other pieces. This worthy divine died on the 20th of April 1703, and left three ſons: Joſeph, the ſubject of the next article; Gulſton, who died while governor of Fort St George; Lancelot, maſter of arts, and fellow of Magdalen College in Oxford; and one daughter, firſt married to Dr Sartre prebendary of Weſtminſter, and afterwards to Daniel Combes, Eſq.

ADDISON (Joſeph), ſon of dean Addiſon the ſubject of the laſt article. He was born at Milſton, near Ambreſbury, in Wiltſhire, on the 11th of May 1672; and not being thought likely to live, was baptized the ſame day. He received the firſt rudiments of his education at the place of his nativity, under the reverend Mr Naiſh; but was ſoon removed to Saliſbury, under the care of Mr Taylor; and from thence to the charter-houſe, where he commenced his acquaintance with Sir Richard Steele. About fifteen, he was entered at Queen's College, Oxford, where he applied very cloſely to the ſtudy of claſſical learning, in which he made a ſurpriſing proficiency.

In the year 1687, Dr Lancaſter, dean of Magdalen College, having, by chance, ſeen a Latin poem of Mr Addiſon's, was ſo pleaſed with it, that he immediately got him elected into that houſe, where he took up his degrees of bachelor and maſter of arts. His Latin pieces in the courſe of a few years, were exceedingly admired in both univerſities; nor were they leſs eſteemed abroad, particularly by the celebrated Boileau, who is reported to have ſaid, that he would not have written againſt Perrault, had he before ſeen ſuch excellent pieces by a modern hand. He publiſhed nothing in Engliſh before the twenty-ſecond year of his age; when there appeared a ſhort copy of verſes written by him, and addreſſed to Mr Dryden, which procured him great reputation from the beſt judges. This was ſoon followed by a tranſlation of the Fourth Georgic of Virgil, (omitting the ſtory of Ariſtæus), much commended by Mr Dryden. He wrote alſo the Eſſay on the Georgics, prefixed to Mr Dryden's tranſlation. There are ſeveral other pieces written by him about this time; amongſt the reſt, one dated the 3d of April 1694, addreſſed to H. S. that is, Dr Sacheverel, who became afterwards ſo famous, and with whom Mr Addiſon lived once in the greateſt friendſhip; but their intimacy was ſome time after broken off by their diſagreement in political principles. In the year 1695, he wrote a poem to king William on one of his campaigns, addreſſed to Sir John Somers lord keeper of the great ſeal. This gentleman received it with great pleaſure, took the author into the number of his friends, and beſtowed on him many marks of his favour.

Mr Addiſon had been cloſely preſſed, while at the univerſity, to enter into holy orders; and had once reſolved upon it: but his great modeſty, his natural diffidence, and an uncommonly delicate ſenſe of the importance of the ſacred function, made him afterwards alter his reſolution; and having expreſſed an inclination to travel, he was encouraged thereto by his patron above-mentioned, who by his intereſt procured him from the crown a penſion of L.300 *per annum* to ſupport him in his travels. He accordingly made a tour to Italy in the year 1699; and, in 1701, he wrote a poetical epiſtle from Italy to the earl of Halifax, which has been univerſally eſteemed as a moſt excellent performance. It was tranſlated into Italian verſe by the abbot Antonia Maria Salvini, Greek profeſſor at Florence. In the year 1705, he publiſhed an account of his travels, dedicated to lord Somers; which, though at firſt but indifferently received, yet in a little time met with its deſerved applauſe.

In the year 1702, he was about to return to England, when he received advice of his being appointed to attend prince Eugene, who then commanded for the emperor in Italy: but the death of king William happening ſoon after, put an end to this affair as well as his penſion; and he remained for a conſiderable time unemployed. But an unexpected incident at once raiſed him, and gave him an opportunity of exerting his fine talents to advantage: for in the year 1704, the lord treaſurer Godolphin happened to complain to lord Halifax, that the duke of Marlborough's victory at Blenheim had not been celebrated in verſe in the manner it deſerved; and intimated, that he would take it kindly, if his lordſhip, who was the known patron of the poets, would name a gentleman capable of doing juſtice to ſo elevated a ſubject. Lord Halifax replied, ſomewhat haſtily, that he did know ſuch a perſon, but would not mention him; adding, that long had he ſeen, with indignation, men of no merit maintained in luxury at the public expence, whilſt thoſe of real worth and modeſty were ſuffered to languiſh in obſcurity. The treaſurer anſwered very coolly, that he was ſorry there ſhould be occaſion for ſuch an obſervation, but that he would do his endeavour to wipe off ſuch reproaches for the future; and he engaged his honour, that whoever his lordſhip named, as a perſon capable of celebrating this victory, ſhould meet with a ſuitable recompence. Lord Halifax thereupon named Mr Addiſon; inſiſting, however, that the treaſurer himſelf ſhould ſend to him; which he promiſed. Accordingly he prevailed on Mr Boyle (afterwards lord Carlton) then chancellor of the exchequer, to make the propoſal to Mr Addiſon; which he did in ſo polite a manner, that our author readily undertook the taſk. The lord-treaſurer had a ſight of the piece, when it was carried no farther than the celebrated ſimile of the angel; and was ſo pleaſed with it, that he immediately appointed Mr Addiſon a commiſſioner of appeals, vacant by the promotion of Mr Locke, choſen one of the lords commiſſioners for trade. The Campaign is addreſſed to the duke of Marlborough; it gives a ſhort view of the military tranſactions in 1704, and contains a noble deſcription of the two great actions at Schellemberg and Blenheim. In 1705, he attended Lord Halifax to Hanover; and the year following was appointed under-ſecretary to Sir Charles Hedges ſecretary of ſtate; in which office he acquitted himſelf ſo well, that the earl of Sunderland, who ſucceeded Sir Charles in December, continued Mr. Addiſon in his employment.

A taſte for operas beginning at this time to prevail in England, and many perſons having ſolicited Mr Addiſon to write one, he complied with their requeſt, and compoſed his Roſamond. This, however, whether from the defect of the muſic, or from the prejudices in favour of the Italian taſte, did not ſucceed upon the ſtage; but the poetry of it has, and always will be, juſtly admired. About this time, Sir Richard Steele compoſed his comedy of the Tender Huſband, to which Mr Addiſon wrote a prologue. Sir Richard ſurpriſed him with a dedication of this play, and acquainted the public, that he was indebted to him for ſome of the moſt excellent ſtrokes in the performance. The marquis of Wharton, being appointed Lord Lieutenant of Ireland in 1709, took Mr Addiſon with him as his ſecretary. Her majeſty alſo made him keeper of the records of Ireland, and, as a farther mark of her favour, conſiderably augmented the ſalary annexed to that place. Whilſt he was in this kingdom, the Tatler was firſt publiſhed; and he diſcovered his friend Sir Richard Steele to be the author, by an obſervation on Virgil, which he had communicated to him. He afterwards aſſiſted conſiderably in carrying on this paper, which the author acknowledges. The Tatler being laid down, the Spectator was ſet on foot, and Mr Addiſon furniſhed great part of the moſt admired papers. The Spectator made its firſt appearance in March 1711, and was brought to a concluſion in September 1712.

His celebrated Cato appeared in 1713. He formed the deſign of a tragedy upon this ſubject when he was very young, and wrote it when on his travels; he retouched it in England, without any intention of bringing it on the ſtage; but his friends being perſuaded it would ſerve the cauſe of liberty, he was prevailed on by their ſolicitations, and it was accordingly exhibited on the theatre, with a prologue by Mr Pope, and an epilogue by Dr Garth. It was received with the moſt uncommon applauſe, having run thirty-five nights without interruption. The Whigs applauded every line in which liberty was mentioned, as a ſatire on the Tories; and the Tories echoed every clap, to ſhow that the ſatire was unfelt. When it was printed, notice was given that the Queen would be pleaſed if it was dedicated to her; "but as he had deſigned that compliment elſewhere, he found himſelf obliged," ſays Tickell, "by his duty on the one hand, and his honour on the other, to ſend it into the world without any dedication." It was no leſs eſteemed abroad, having been tranſlated into French, Italian, and German; and it was acted at Leghorn, and ſeveral other places, with vaſt applauſe. The Jeſuits of St Omers made a Latin verſion of it, and the ſtudents acted it with great magnificence.

About this time, another paper called the Guardian was publiſhed by Steele, to which Addiſon was a principal contributor. It was a continuation of the Spectator, and was diſtinguiſhed by the ſame elegance and the ſame variety; but in conſequence of Steele's propenſity to politics, was abruptly diſcontinued in order to write the Engliſhman.

The papers of Addiſon are marked in the Spectator by one of the letters in the name of *Clio*, and in the Guardian by a *Hand*. Many of theſe papers were written with powers truly comic, with nice diſcrimination of characters, and accurate obſervation of natural or accidental deviations from propriety: but it was not ſuppoſed that he had tried a comedy on the ſtage, till Steele, after his death, declared him the author of "The Drummer." This, however, he did not know to be true by any cogent teſtimony: for when Addiſon put the play into his hands, he only told him it was the work of a gentleman in the company; and when it was received, as is confeſſed, with cold diſapprobation, he was probably leſs willing to claim it. Tickell omitted it in his collection; but the teſtimony of Steele, and the total ſilence of any other claimant, has determined the public to aſſign it to Addiſon, and it is now printed with his other poetry. Steele carried "The Drummer" to the play-houſe, and afterwards to the preſs, and ſold the copy for 50 guineas. To Steele's opinion may be added the proof ſupplied by the play itſelf, of which the characters are ſuch as Addiſon would have delineated, and the tendency ſuch as Addiſon would have promoted.

It is ſaid that Mr Addiſon intended to have compoſed an Engliſh dictionary upon the plan of the Italian (Della Cruſca), but, upon the death of the queen, being appointed ſecretary to the lords juſtices, he had not leiſure to carry on ſuch a work. When the earl of Sunderland was appointed lord lieutenant of Ireland, Mr Addiſon was again made ſecretary for the affairs of that kingdom; and upon the earl's being removed from the lieutenancy, he was choſen one of the lords of trade.

Not long afterwards an attempt was made to revive the Spectator, at a time indeed by no means favourable to literature, when the ſucceſſion of a new family to the throne filled the nation with anxiety, diſcord, and confuſion; and either the turbulence of the times or the ſatiety of the readers put a ſtop to the publication, after an experiment of 80 numbers, which were afterwards collected into an eighth volume, perhaps more valuable than any of thoſe that went before it: Addiſon produced more than a fourth part.

In 1715, he began the Freeholder, a political paper, which was much admired, and proved of great uſe at that juncture. He publiſhed alſo, about this time, verſes to Sir Godfrey Kneller upon the king's picture, and ſome to the princeſs of Wales with the tragedy of Cato.

Before the arrival of king George he was made ſecretary to the regency, and was required by his office to ſend notice to Hanover that the queen was dead, and that the throne was vacant. To do this would not have been difficult to any man but Addiſon, who was ſo overwhelmed with the greatneſs of the event, and ſo diſtracted by choice of expreſſion, that the lords, who could not wait for the niceties of criticiſm, called Mr Southwell, a clerk in the houſe, and ordered him to diſpatch the meſſage. Southwell readily told what was neceſſary, in the common ſtyle of buſineſs, and valued himſelf upon having done what was too hard for Addiſon.

In 1716, he married the counteſs dowager of Warwick, whom he had ſolicited by a very long and anxious courtſhip. He is ſaid to have firſt known her by becoming tutor to her ſon. The marriage, if uncontradicted report can be credited, made no addition to his happineſs; it neither found them nor made them equal. She always remembered her own rank, and thought herſelf intitled to treat with very little ceremony the tutor of her ſon. It is certain that Addiſon has left behind him no encouragement for ambitious love. The year after, 1717, he roſe to his higheſt elevation, being made ſecretary of ſtate; but is repreſented as having proved unequal to the duties of his place. In the houſe of commons he could not ſpeak, and therefore was uſeleſs to the defence of the government. In the office he could not iſſue an order without loſing his time in queſt of fine expreſſions. At laſt, finding by experience his own inability for public buſineſs, he was forced to ſolicit his diſmiſſion, with a penſion of 1500l. a-year. Such was the account of thoſe who were inclined to detract from his abilities; but by others his relinquiſhment was attributed to declining health, and the neceſſity of receſs and quiet.

In his retirement, he applied himſelf to a religious work,* which he had begun long before; part of which, ſcarce finiſhed, has been printed in his works. He intended alſo to have given an Engliſh paraphraſe of ſome of David's pſalms. But his ailments increaſed, and cut ſhort his deſigns. He had for ſome time been oppreſſed by an aſthmatic diſorder, which was now aggravated by a dropſy, and he prepared to die conformably to his precepts and profeſſions. He ſent, as Pope relates, a meſſage by the earl of Warwick to Mr Gay, deſiring to ſee him: Gay, who had not viſited him for ſome time before, obeyed the ſummons, and found himſelf received with great kindneſs. The purpoſe for which the interview had been ſolicited was then diſcovered: Addiſon told him, that he had injured him; but that, if he recovered, he would recompenſe him. What the injury was he did not explain, nor did Gay ever know; but ſuppoſed that ſome preferment deſigned for him had by Addiſon's intervention been withheld.—Another death-bed interview, of a more ſolemn nature, is recorded: Lord Warwick was a young man of very irregular life, and perhaps of looſe opinions. Addiſon, for whom he did not want reſpect, had very diligently endeavoured to reclaim him; but his arguments and expoſtulations had no effect: One experiment, however, remained to be tried. When he found his life near its end, he directed the young lord to be called; and when he deſired, with great tenderneſs, to hear his laſt injunctions, told him, “I have ſent for you that yon may ſee how a Chriſtian can die.” What effect this awful ſcene had on the earl's behaviour is not known: he died himſelf in a ſhort time. Having given directions to Mr Tickell for the publication of his works, and dedicated them on his death-bed to his friend Mr Craggs, he died June 17, 1719, at Holland-houſe, leaving no child but a daughter who is ſtill living.

Addiſon's courſe of life before his marriage has been detailed by Pope. He had in the houſe with him Budgell, and perhaps Philips. His chief companions were Steele, Budgell, Philips, Carey, Davenant, and Colonel Brett. With one or other of theſe he always breakfaſted. He ſtudied all morning; then dined at a tavern, and went afterwards to Button's. From the coffeehouſe he went again to the tavern, where he often ſat late, and drank too much wine.

Dr Johnſon, in delineating the character of Addiſon, obſerves with Tickell, that he employed wit on the ſide of virtue and religion. He not only made the proper uſe of wit himſelf, but taught it to others; and from his time it has been generally ſubſervient to the cauſe of reaſon and truth. He has diſſipated the prejudice that had long connected gaiety with vice, and eaſineſs of manners with laxity of principles. He has reſtored virtue to its dignity, and taught innocence not to be aſhamed. This is an elevation of literary character, “above all Greek, above all Roman fame.” No greater felicity can genius attain than that of having purified intellectual pleaſure, ſeparated mirth from indecency, and wit from licentiouſneſs; of having taught a ſucceſſion of writers to bring elegance and gaiety to the aid of goodneſs; and, to uſe expreſſions yet more awful, of having “turned many to righteouſneſs.” As a deſcriber of life and manners, he muſt be allowed to ſtand perhaps the firſt of the firſt rank. His humour, which, as Steele obſerves, is peculiar to himſelf, is ſo happily diffuſed as to give the grace of novelty to domeſtic ſcenes and daily occurrences. He never “outſteps the modeſty of nature,” nor raiſes merriment or wonder by the violation of truth. His figures neither divert by diſtortion, nor amaze by aggravation. He copies life with ſo much fidelity, that he can be hardly ſaid to invent; yet his exhibitions have an air ſo much original, that it is difficult to ſuppoſe them not merely the product of imagination. As a teacher of wiſdom he may be confidently followed. His religion has nothing in it enthuſiaſtic or ſuperſtitious; he appears neither weakly credulous nor wantonly ſceptical; his morality is neither dangerouſly lax nor impracticably rigid. All the enchantment of fancy and all the cogency of argument are employed to recommend to the reader his real intereſt, the care of pleaſing the author of his being. Truth is ſhown ſometimes as the phantom of a viſion, ſometimes appears half-veiled in an allegory; ſometimes attracts regard in the robes of fancy, and ſometimes ſteps forth in the confidence of reaſon. She wears a thouſand dreſſes, and in all is pleaſing.

The

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*Evidences of the Xian Religion.

Addiſon.

The Doctor, however, has related the following anecdote, which every admirer of Addiſon, every man of feeling, muſt be reluctant to believe. "Steele (ſays the Doctor), whoſe imprudence of generoſity, or vanity of profuſion, kept him always incurably neceſſitous, upon ſome preſſing exigence, in an evil hour, borrowed an hundred pounds of his friend, probably without much purpoſe of repayment; but Addiſon, who ſeems to have had other notions of a hundred pounds, grew impatient of delay, and reclaimed his loan by an execution. Steele felt, with great ſenſibility, the obduracy of his creditor; but with emotions of ſorrow rather than of anger." It is much to be wiſhed, ſays Dr Kippis, that Dr. Johnſon had produced his authority for this narration. It is very poſſible, that it may be only a ſtory the Doctor had ſomewhere heard in converſation, and which is entirely groundleſs: "and this I am the rather inclined to believe, as I have been aſſured, by one of the moſt reſpectable characters in the kingdom, that the fact hath no foundation in truth." Mr Potter, in a late publication, hath informed us, that he is told by the beſt authority, that the ſtory is an abſolute falſhood.

Mr Tyers, in "An hiſtorical Eſſay on Mr. Addiſon," printed, but not publiſhed, has mentioned ſome facts concerning him, with which we were not before acquainted. Theſe are, that he was laid out for dead as ſoon as he was born: that, when he addreſſed his verſes on the Engliſh poets to Henry Sacheverell, he courted that gentleman's ſiſter: that, whenever Jacob Tonſon came to him for the Spectator, Bayle's French Hiſtorical and Critical Dictionary lay always open before him: that, upon his return to England, after his travels, he diſcharged ſome old debts he had contracted at Oxford, with the generoſity of good intereſt: that he was put into plentiful circumſtances by the death of a brother in the Eaſt Indies: that, having received encouragement from a married lady, of whom he had been formerly enamoured, he had the integrity to reſiſt the temptation: that he refuſed a gratification of a three hundred pounds bank-note, and afterwards a diamond-ring of the ſame value, from a Major Dunbar, whom he had endeavoured to ſerve in Ireland by his intereſt with lord Sunderland: and that his daughter by lady Warwick is ſtill alive and unmarried, reſiding at Bilton near Rugby, and poſſeſſing an income of more than twelve hundred a-year.

The following letter, which probably relates to the caſe of Major Dunbar, reflects great honour on Mr Addiſon's integrity. "*June* 26. 1715. SIR, I find there is a very ſtrong oppoſition formed againſt you; but I ſhall wait on my lord lieutenant this morning, and lay your caſe before him as advantageouſly as I can, if he is not engaged in other company. I am afraid what you ſay of his grace does not portend you any good. And now, Sir, believe me, when I aſſure you I never did, nor ever will, on any pretence whatſoever, take more than the ſtated and cuſtomary fees of my office. I might keep the contrary practice concealed from the world, were I capable of it, but I could not from myſelf; and I hope I ſhall always fear the reproaches of my own heart more than thoſe of all mankind. In the mean time, if I can ſerve a gentleman of merit, and ſuch a character as you bear in the world, the ſatisfaction I meet with on ſuch an occaſion is always a ſufficient, and the only reward to, Sir, your moſt obedient, humble ſervant, J. ADDISON."—The anecdote which follows was told by the late Dr Birch. Addiſon and Mr Temple Stanyan were very intimate. In the familiar converſations which paſſed between them, they were accuſtomed freely to diſpute each other's opinions. Upon ſome occaſion, Mr Addiſon lent Stanyan five hundred pounds. After this, Mr Stanyan behaved with a timid reſerve, deference, and reſpect; not converſing with the ſame freedom as formerly, or canvaſſing his friend's ſentiments. This gave great uneaſineſs to Mr Addiſon. One day they happened to fall upon a ſubject, on which Mr Stanyan had always been uſed ſtrenuouſly to oppoſe his opinion. But, even upon this occaſion, he gave way to what his friend advanced, without interpoſing his own view of the matter. This hurt Mr Addiſon ſo much, that he ſaid to Mr Stanyan, "Either contradict me, or pay me the money."

In Tickell's edition of Mr Addiſon's works there are ſeveral pieces hitherto unmentioned, viz. The Diſſertation on Medals; which, though not publiſhed till after his death, yet he had collected the materials, and began to put them in order, at Vienna, in 1702. A pamphlet, intitled, The preſent State of the War, and the Neceſſity of an Augmentation, conſidered. The late Trial and Conviction of Count Tariff. The Whig Examiner came out on the 14th of September 1716: there were five of theſe papers attributed to Mr Addiſon, and they are the ſevereſt pieces he ever wrote. He is ſaid alſo to have been the author of a performance intitled *Diſſertatio de inſignioribus Romanorum Poetis*, and of a Diſcourſe on Ancient and Modern Learning.

Additament ‖ Addition of place.

ADDITAMENT, ſomething added to another. Thus phyſicians call the ingredients added to a medicine already compounded, *additaments*.

ADDITION, is the joining together or uniting two or more things, or augmenting a thing by the acceſſion of others thereto.

ADDITION, in ARITHMETIC, ALGEBRA, &c. See theſe articles.

ADDITION, in muſic, a dot marked on the right ſide of a note, ſignifying that it is to ſounded or lengthened half as much more as it would have been without ſuch mark.

ADDITION, in law, is that name or title which is given to a man over and above his proper name and ſurname, to ſhow of what eſtate, degree, or myſtery he is; and of what town, village or country.

ADDITIONS of Eſtate or *Quality*, are Yeoman, Gentleman, Eſquire, and ſuch like.

ADDITIONS of Degree, are thoſe we call names of dignity: as Knight, Lord, Earl, Marquis, and Duke.

ADDITIONS of Myſtery, are ſuch as ſcrivener, painter, maſon, and the like.

ADDITIONS of Place, are, of Throp, of Dale, of Woodſtock.—Where a man hath houſhold in two places, he ſhall be ſaid to dwell in both; ſo that his addition in either may ſuffice. Knave was anciently a regular addition. By ſtat. 1. Hen. V. cap. 5. it was ordained, that in ſuch ſuits or actions where proceſs of outlawry lies, ſuch addition ſhould be made to the name of the defendant, to ſhow his eſtate, myſtery, and place where he dwells; and that the writs not having ſuch additions ſhall abate if the defendant take exception thereto; but not by the office of the court. The reaſon of this ordinance was, that one man might not be troubled by the outlawry of another; but by reaſon of the certain addition, every perſon might bear his own burden.

ADDITIONS, in diſtilling, a name given to ſuch things as are added to the waſh, or liquor, while in a ſtate of fermentation, in order to improve the vinoſity of the ſpirit, procure a larger quantity of it, or give it a particular flavour. All things, of whatever kind, thus added in the time of fermentation, are called by thoſe of the buſineſs who ſpeak moſt intelligently *additions;* but many confound them with things of a very different nature, under the name of *ferments.* See DISTILLING.

ADDITIONS, in heraldry, ſome things added to a coat of arms, as marks of honour; and therefore directly oppoſite to abatements. Among additions we reckon BORDURE, QUARTER, CANTON, GYRON, PILE, &c. See theſe articles.

ADDRESS, in a general ſenſe, is uſed for ſkill and good management, and of late has been adopted from the French. It is uſed alſo in commerce, as ſynonymous with direction to a perſon or place. The word is formed of the French verb *adreſſer, To direct any thing to a perſon.*

ADDUCENT MUSCLES, or ADDUCTORS, in anatomy, thoſe muſcles which pull one part of the body towards another. See ANATOMY, *Table of the Muſcles.*

ADEB, in commerce, the name of a large Egyptian weight, uſed principally for rice, and conſiſting of 210 okes, each of three rotolos, a weight of about two drams leſs than the Engliſh pound. But this is no certain weight; for at Roſetto the adeb is only 150 okes.

ADEL, a kingdom on the eaſtern coaſt of Africa, which reaches as far as the ſtraits of Babelmandel, which unite the Red Sea to the Sea of Arabia. This country produces corn, and feeds a great number of cattle. The inhabitants carry on a trade in gold, ſilver, ivory, oil, frankincenſe, a ſort of pepper, and other merchandiſes of Arabia and the Indies. The king was formerly a vaſſal to the grand negus of Abyſſinia: but being Mahometans, and the Abyſſinians a ſort of Chriſtians, they could not agree; and in 1535 came to an open rupture, when the Adelines threw off the yoke, ſeeking protection from the Grand Signior. The principal places are, Adela, ſeated in the centre of the country, and is the town where the king reſides: Zeila, near the Arabian Sea, is a rich town, and has a good trade: Barbora, near the ſea-coaſt, is an ancient trading town. It rains very ſeldom in this country.

ADELIA, a genus of the monadelphia order, belonging to the diœcia claſs of plants; the characters of which are; The *MALE calyx* is a perianthium one-leaved, three-parted; the florets ſublanced and concave: No *corolla:* The *ſtamina* conſiſt of many capillary filaments the length of the calyx, conjoined at the baſe in a cylinder; the antheræ are roundiſh. The *FEMALE calyx* is a five-leaved perianthium; the leaflets ſublanced, concave, perſiſtent: No *corolla:* The *piſtillum* has a roundiſh germen; the ſtyli are three, ſhort, and divaricated; the ſtigmata lacerated: The *perianthium* is a three-grained, roundiſh, three-celled capſule: The *ſeeds* are ſolitary and roundiſh. In the natural method, this genus belongs to the 38th order, Tricoccæ. Of this genus there are three ſpecies; the *bernardia,* the *ricinella,* and *acidoton,* for which we have no proper names in Engliſh. They are natives of Jamaica, and are akin to the ricinus or croton, and may be propagated in hot-beds from ſeeds procured from Jamaica.

ADELME, or ALDHELM, ſon to Kenred, nephew to Ina king of the Weſt-Saxons; after having been educated abroad, was abbot of Malmſbury 30 years. He was the firſt Engliſhman who wrote in Latin, the firſt who brought poetry into England, and the firſt biſhop of Sherburn. He lived in great eſteem till his death, which happened in 709. He was canonized, and many miracles were told of him. He is mentioned with great honour by Camden and Bayle, and his life was written by William of Malmſbury.

ADELPHIANI, in church-hiſtory, a ſect of ancient heretics, who faſted always on Sundays.

ADELSCALC, in ancient cuſtoms, denotes a ſervant of the king. The word is alſo written *adelſcalche,* and *adelſcalcus.* It is compounded of the German *adel,* or *edel,* "noble," and *ſcalc,* "ſervant." Among the Bavarians, *adelſcalcs* appear to have been the ſame with royal *thanes* among the Saxons, and thoſe called *miniſtri regis* in ancient charters.

ADEMPTION, in the civil law, implies the revocation of a grant, donation, or the like.

ADEN, formerly a rich and conſiderable town of Arabia the Happy. It is ſeated by the ſea-ſide, a little eaſtward of the ſtraits of Babelmandel.

ADENANTHERA, BASTARD FLOWER-FENCE, a genus of the monogynia order, belonging to the decandria claſs of plants. In the natural method, it belongs to the 33d order, *Lomentaceæ.* The characters are: The *calyx* is a perianthium conſiſting of one very ſmall five-toothed leaf. The *corolla* conſiſts of five bell-ſhaped lanceolate ſeſſile petals, convex within and concave under. The *ſtamina* have ten erect ſubulated filaments ſhorter than the corolla; the antheræ are roundiſh, incumbent, bearing a globular gland on the exterior top. The *piſtillum* has a long gibbous germen; the ſtylus ſubulated the length of the ſtamina; the ſtigma ſimple. The *pericarpium* is a long compreſſed membranous legumen. The *ſeeds* are very numerous, roundiſh, and remote.

Only one ſpecies of this plant is known in Britain: but there is a variety, with ſcarlet ſeeds; which, however, is rare, and grows very ſlowly. It is a native of India, and riſes to a conſiderable height. It is as large as the tamarind tree; ſpreads its branches wide on every ſide, and makes a fine ſhade; for which reaſon, it is frequently planted by the inhabitants in their gardens or near their habitations. The leaves of this tree are doubly winged, the flowers of a yellow colour, and diſpoſed in a long bunch. Theſe are ſucceeded by long twiſted membranaceous pods, incloſing ſeveral hard compreſſed ſeeds, of a beautiful ſcarlet, or ſhining black, colour. This plant muſt be raiſed in a hot-bed, and kept during the winter in a ſtove.

ADENBURG, or ALDENBURG, a town of Weſtphalia, and in the duchy of Burg, ſubject to the Elector Palatine. It is 12 miles N. E. of Cologne, and 17 W. of Bonn; E. long. 7. 25. lat. 51. 2.

ADENOGRAPHY, that part of anatomy which treats of the glandular parts. See ANATOMY.

ADENOIDES, glandulous, or of a glandular form; an epithet applied to the prostatæ.

ADENOLOGY, the ſame with Adenography.

ADENOS, a kind of cotton, otherwiſe called *marine cotton*. It comes from Aleppo by the way of Marſeilles, where it pays 20 *per cent.* duty.

ADEONA, in mythology, the name of a goddeſs invoked by the Romans when they ſet out upon a journey.

ADEPHAGIA, in mythology, the goddeſs of gluttony, to whom the Sicilians paid religious worſhip.

ADEPS, in anatomy, the fat found in the abdomen. It alſo ſignifies animal fat of any kind.

ADEPTS, a term among alchemiſts for thoſe who pretended to have found the panacea or philoſopher's-ſtone.

ADERBIJAN, a province of Perſia, bounded on the N. by Armenia Proper, on the S. by Irac-Agemi, on the E. by Ghilan, and on the W. by Curdiſtan. The principal town is Tauris; from 42. to 48. E. long. from 36. to 39. lat.

ADERNO, a ſmall place in the Val Di Demona in the kingdom of Sicily: E. long. 15. 25. lat. 28. 5. The ancient Adranum.

ADES, or Hades, denotes the inviſible ſtate. In the heathen mythology, it comprehends all thoſe regions that lie beyond the river Styx, viz. Erebus, Tartarus, and Elyſium. See Hell.

ADESSENARIANS, Adessenarii, in church-hiſtory, a ſect of Chriſtians who hold the real preſence of Chriſt's body in the Euchariſt, though not by way of tranſubſtantiation. They differ conſiderably as to this preſence; ſome holding that the body of Chriſt is in the bread; others that it is about the bread; and others that it is under the bread.

ADFILIATION, a Gothic cuſtom, whereby the children of a former marriage are put upon the ſame footing with thoſe of the ſecond. This is alſo called *unio prolium*, and ſtill retained in ſome parts of Germany.

AD FINES (Antonine), a town of Swiſſerland, ſuppoſed to be the modern *Pfin*, in the north of the diſtrict of Turgow, on the rivulet Thur, not far from the borders of Suabia, about half-way between Conſtance and Frauenfield. So called, becauſe when Cecinna, general of the emperor Vitellius, with the auxiliary Rhetians, defeated the Helvetii, the former extended their borders thus far, their territory ending here; and, in time of the Romans, it was the laſt town in this quarter, and of ſome repute.

ADHA, a feſtival which the Mahometans celebrate on the 10th day of the month *Dhoulhegiat*, which is the 12th and laſt of their year. This month being particularly deſtined for the ceremonies which the pilgrims obſerve at Mecca, it takes its name from thence, for the word ſignifies *the month of Pilgrimage*. On that day they ſacrifice with great ſolemnity, at Mecca, and no where elſe, a ſheep, which is called by the ſame name as the feſtival itſelf. The Turks commonly call this feſtival the *Great Bairam*, to diſtinguiſh it from the leſſer, which ends their faſt, and which the Chriſtians of the Levant call the *Eaſter of the Turks*. The Mahometans celebrate this feſtival, out of the city of Mecca, in a neighbouring valley; and ſometimes they ſacrifice there a camel. See Bairam.

ADHATODA, in botany. See Justicia.

Action of ADHERENCE, in Scots law; an action competent to a huſband or wife, to compel either party to adhere in caſe of deſertion.

ADHESION, in a general ſenſe, implies the ſticking or adhering of bodies together.

Adhesion, in philoſophy. See Cohesion.

Adhesion, in anatomy, a term for one part ſticking to another, which in a natural ſtate are ſeparate. For the moſt part, if any of thoſe parts in the thorax or belly lie in contact, and inflame, they grow together. The lungs very frequently adhere to the pleura.

ADHIL, in aſtronomy, a ſtar of the ſixth magnitude, upon the garment of Andromeda, under the laſt ſtar in her foot.

ADHOA, in ancient cuſtoms, denotes what we otherwiſe call *relief*. In which ſenſe we ſometimes alſo find the word written *adoha*, *adhoamentum*, and *adhogamentum*.

ADIANTHUM, maiden-hair; a genus of the order of filices, belonging to the cryptogamia claſs of plants. The fructifications are collected in oval ſpots under the reflected tops of the fronds.

Species. Of this genus botanical writers enumerate fifteen ſpecies; the moſt remarkable are the following. 1. The capillus veneris, or true maiden-hair, is a native of the ſouthern parts of France, from whence it is ſent to Britain; though it is likewiſe ſaid to grow plentifully in Cornwall, and the Trichomanes has been almoſt univerſally ſubſtituted for it. 2. The pedatum, or American maiden-hair, is a native of Canada; and grows in ſuch quantities, that the French ſend it from thence in package for other goods, and the apothecaries of Paris uſe it for maiden-hair in the compoſitions wherein that is ordered. 3. The trapeziforme, or black American maiden-hair, is a native of Jamaica; and has ſhining black ſtalks, and leaves of an odd ſhape, which make an agreeable variety among other plants, ſo is ſometimes cultivated in gardens.

Culture. The firſt ſpecies grows naturally out of the joints of walls, and fiſſures of rocks. It ought therefore to be planted in pots filled with gravel and lime-rubbiſh; where it will thrive much better than in good earth. It muſt alſo be ſheltered under a frame during the winter.—The ſecond is to be treated in the ſame manner; but the third will not thrive in Britain, unleſs kept in a ſtove during the winter.

Properties. The true maiden-hair has been greatly celebrated in diſorders of the breaſt proceeding from a thinneſs and acrimony of the juices; and likewiſe for opening obſtructions of the viſcera, and promoting the expectoration of tough phlegm. But modern practice pays little regard to it; the aſplenium trichomanes, or Engliſh maiden-hair, ſupplying its place. See Asplenium.

ADIAPHORISTS, in church-hiſtory, a name importing lukewarmneſs, given, in the 16th century, to the moderate Lutherans, who embraced the opinions of Melancthon, whoſe diſpoſition was vaſtly more pacific than that of Luther.

ADIAPHOROUS, Adiaphorus, a name given by Mr Boyle to a kind of ſpirit diſtilled from tartar and ſome other vegetable bodies; and which is neither acid, vinous, nor urinous; but in many reſpects different from any other ſort of ſpirit.

ADJAZZO, Adrazzo, or Ajaccio, in geography, a handſome town and caſtle of Corſica in the Mediterranean, with a biſhop's ſee, and a good harbour. It is populous, and fertile in wine. It is 27 miles S. W. of Corte. E. long. 41. 54. lat. 38. 5.

ADJECTIVE, in grammar, a kind of noun joined with a ſubſtantive, either expreſſed or implied, to ſhow its qualities or accidents. See GRAMMAR.

ADIGE, a river in Italy, which taking its riſe ſouth of the lake Glace among the Alps, runs ſouth by Trent, then eaſt by Verona in the territory of Venice, and falls into the gulph of Venice, north of the mouth of the Po.

ADJOURNMENT, the putting off a court, or other meeting to another day. In England, there is a difference between the adjournment and the prorogation of the parliament; the former being not only for a ſhorter time, but alſo done by the houſe itſelf; whereas the latter is an act of royal authority.

ADIPOSE, a term uſed by anatomiſts for any cell, membrane, &c. that is remarkable for its fatneſs.

ADIRBEITSAN, in geography, a province of Perſia, in Aſia, and part of the ancient Media. It is bounded on the N. by the province of Shirvan, on the S. by Irac-Agemi and Curdiſtan, on the E. by Gilan and the Caſpian ſea, and on the W. by Turcomania.

ADIT, in a general ſenſe, the paſſage to, or entrance of, any thing.

ADIT of a Mine, the hole, or aperture, whereby it is entered and dug, and by which the water and ores are carried away. The term amounts to the ſame with *cuniculus* or *drift*, and is diſtinguiſhed from *air-ſhaft*. The adit is uſually made on the ſide of a hill, towards the bottom thereof, about four, five, or ſix feet high, and eight wide, in form of an arch; ſometimes cut in the rock, and ſometimes ſupported with timber, ſo conſtructed as that the ſole or bottom of the adit may anſwer to the bottom of the ſhaft, only ſomewhat lower, that the water may have a ſufficient current to paſs away without the uſe of the pump. Damps and the impurity of the air are the great impediments againſt driving adits above 20 or 30 fathoms, by reaſon of the neceſſity, in this caſe, of letting down air-ſhafts from the day to meet the adit, which are often very expenſive, both on account of the great depth of mines, and the hardneſs of the mineral ſtrata to be cut through. The beſt remedies againſt this is that practiſed in the coal-mines near Liege, where they work their adits without air-ſhafts: the manner of which is deſcribed by Sir Robert Moray. Vid. Phil. Tranſ. N°. 5.

ADIT of a Mine is ſometimes uſed for the air-ſhaft itſelf, being a hole driven perpendicularly from the ſurface of the earth into ſome part of a mine to give entrance to the air. To draw off the ſtanding water in winter, in deep mines, they drive up an adit, or air-ſhaft, upon which the air diſengages itſelf from the water, when it begins to run with ſuch violence as produces a noiſe equal to the burſting of a cannon, daſhes every thing in the way againſt the ſides of the mine, and looſens the very rocks at a diſtance. Ibid. N° 26.

ADJUDICATION, implies the act of adjudging, or determining, a cauſe in favour of ſome perſon.

ADJUDICATION, in Scots law, the name of that action by which a creditor attaches the heritable eſtate of his debtor, or his debtor's heir, in order to appropriate it to himſelf, either in payment or ſecurity of his debt; or that action by which the holder of an heritable right, labouring under any defect in point of form, may ſupply that defect.

ADJUNCT, among philoſophers, ſignifies ſomething added to another, without being any neceſſary part of it. Thus water abſorbed by cloth or a ſpunge, is an adjunct, but no neceſſary part of either of theſe ſubſtances.

ADJUNCT, in metaphyſics, ſome quality belonging to either the body or mind, whether natural or acquired. Thus thinking is an adjunct of the mind, and growth an adjunct of the body.

ADJUNCT, in muſic, a word which is employed to denominate the connection or relation between the principal mode and the modes of its two-fifths, which, from the intervals that conſtitute the relation between them and it, are called its *adjuncts*.

ADJUNCT is alſo uſed to ſignify a colleague, or ſome perſon aſſociated with another as an aſſiſtant.

ADJUNCT Gods, or *ADJUNCTS of the Gods*, among the Romans, were a kind of inferior deities, added as aſſiſtants to the principal ones, to eaſe them in their functions. Thus, to Mars was adjoined Bellona, and Nemeſis to Neptune, Salacia; to Vulcan, the Cabiri; to the Good Genius, the Lares; to the Evil, the Lemures, &c.

ADJUNCTS, in rhetoric and grammar, ſignify certain words or things added to others, to amplify or augment the force of the diſcourſe.

ADJUNCTS or ADJOINTS, in the royal academy of ſciences at Paris, denote a claſs of members, attached to the purſuit of particular ſciences. The claſs of *Adjuncts* was created in 1716, in lieu of the *Eleves*: they are twelve in number; two for geometry, two for mechanics, two for aſtronomy, two for anatomy, two for chemiſtry, and two for botany. The *Eleves* not taken into this eſtabliſhment were admitted on the foot of ſupernumerary *Adjuncts*.

ADJUTANT, in the military art, is an officer whoſe buſineſs it is to aſſiſt the major. Each battalion of foot and regiment of horſe has an adjutant, who receives the orders every night from the brigade-major; which, after carrying them to the colonel, he delivers out to the ſerjeants. When detachments are to be made, he gives the number to be furniſhed by each company or troop, and aſſigns the hour and place of rendezvous. He alſo places the guards; receives, and diſtributes the ammunition to the companies, &c.; and, by the major's orders, regulates the prices of bread, beer, and other proviſions. The word is ſometimes uſed by the French for an *aid-du-camp*.

ADJUTANTS-general, among the jeſuits, a ſelect number of fathers, who reſided with the general of the order, each of whom had a province or country aſſigned him, as England, Holland, &c. and their buſineſs was to inform the father-general of ſtate-occurrences in ſuch countries. To this end they had their correſpondents delegated, emiſſaries, viſitors, regents, provincials, &c.

ADJUTORIUM, a term uſed by phyſicians for any medicine in a preſcription but the capital one.

ADLE-EGGS, ſuch as have not received an impregnation from the ſemen of the cock.

ADLEGATION, in the public law of the German empire, a right claimed by the ſtates of the empire of adjoining plenipotentiaries, in public treaties and negociations, to thoſe of the emperor, for the tranſaction of matters which relate to the empire in general. In which ſenſe *adlegation* differs from *legation*, which is the right of ſending ambaſſadors on a perſon's own account.—Several princes and ſtates of the empire enjoy the right of *legation*, who have not that of *adlegation*, and *vice verſa*. The biſhops, for inſtance, have the right of *adlegation* in the treaties which concern the common intereſt, but no right of *legation* for their own private affairs. The like had the duke of Mantua.—The emperor allows the princes of Germany the privilege of *legation*, but diſputes that of *adlegation*. They challenge it as belonging to them *jure regni*, which they enjoy in common with the emperor himſelf.

ADLOCUTION, Adlocutio, in antiquity, is chiefly underſtood of ſpeeches made by Roman generals to their armies, to encourage them before a battle. We frequently find theſe adlocutions expreſſed on medals by the abbreviature Adlocut. Coh.—The general is ſometimes repreſented as ſeated on a tribunal, often on a bank or mount of turf, with the cohorts ranged orderly round him, in *manipuli*, and *turmæ*. The uſual formula in adlocutions was, *Fortis eſſet ac fidus*.

ADMANUENSES, in ancient law books, denote perſons who ſwore by laying their hands on the book.—In which ſenſe *admanuenſes* amount to the ſame with laymen; and ſtand oppoſed to clerks, who were forbid to ſwear on the book, their word being to be reputed as their oath; whence they were alſo denominated *fide digni*.

ADMEASUREMENT, Admensuratio, in law, a writ which lies for the bringing thoſe to reaſon, or mediocrity, who uſurp more of any thing than their ſhare. This writ lies in two caſes; termed,

Admeasurement of Dower, *Admenſuratio dotis*, where the widow of the deceaſed holds more from the heir, or his guardian, on account of her dower, than of right belongs to her. And

Admeasurement of Paſture, *Admenſuratio paſturæ*; this lies between thoſe who have common of paſtures appendant to their freehold, or common by vicinage, in caſe any of them ſurcharge the common with more cattle than they ought.

ADMINICLE, a term uſed chiefly in old law-books, to imply an aid, help, aſſiſtance, or ſupport. The word is Latin, *adminiculum*; and derived from *adminiculor*, to prop or ſupport.

Adminicle, in Scots law, ſignifies any writing or deed referred to by a party, in an action of law, for proving his allegations.

ADMINICULATOR, an ancient officer of the church, whoſe buſineſs it was to attend to and defend the cauſe of the widows, orphans, and others deſtitute of help.

ADMINISTRATION, in general, the government, direction, or management of affairs, and particularly the exerciſe of diſtributive juſtice; among eccleſiaſtics, it is often uſed to expreſs the giving or diſpenſing the ſacraments, &c.

Administration, is alſo the name given by the Spaniards in Peru to the ſtaple magazine, or warehouſe, eſtabliſhed at Callao, a ſmall town on the S. Sea, which is the port of Lima, the capital of that part of South America, and particularly of Peru. The foreign ſhips, which have leave to trade along that coaſt, are obliged to unload here, paying 13 *per cent.* of the price they ſell for, if the cargo be entire, and even 16 *per cent.* if otherwiſe; beſides which, they pay 3 *per* 1000, duty, for conſulſhip and ſome other ſmall royal rights and claims.

ADMINISTRATOR, in law, he to whom the ordinary commits the adminiſtration of the goods of a perſon deceaſed, in default of an executor.—An action lies for, or againſt an adminiſtrator, as for, or againſt an executor; and he ſhall be accountable to the value of the goods of the deceaſed, and no farther:—unleſs there be waſte, or other abuſe chargeable on him. If the adminiſtrator die, his executors are not adminiſtrators; but the court is to grant a new adminiſtration.—If a ſtranger, who is neither adminiſtrator nor executor, takes the goods of the deceaſed, and adminiſter, he ſhall be charged, and ſued as an executor, not as an adminiſtrator. The origin of adminiſtrators is derived from the civil law. Their eſtabliſhment in England is owing to a ſtatute made in the 31ſt year of Edw. III. Till then, no office of this kind was known beſide that of executor: in caſe of a want of which, the ordinary had the diſpoſal of goods of perſons inteſtate, &c.

Administrator, in Scots law, a perſon legally impowered to act for another whom the law preſumes incapable of acting for himſelf. Thus tutors or curators are ſometimes ſtyled *adminiſtrators in law* to pupils, minors, or fatuous perſons. But more generally the term is uſed to imply that power which is conferred by the law upon a father over the perſons and eſtates of his children during their minority. See Law, N° clxi.

Administrator, is ſometimes uſed for the preſident of a province; for a perſon appointed to receive, manage, and diſtribute, the revenues of an hoſpital or religious houſe; for a prince who enjoys the revenues of a ſecularized biſhopric; and for the regent of a kingdom during a minority of the prince, or a vacancy of the throne.

ADMIRABILIS sal, the ſame with Glauber's ſalt. See Chemistry, n° 124.

ADMIRAL, a great officer or magiſtrate, who has the government of a navy, and the hearing of all maritime cauſes.

Authors are divided with regard to the origin and denomination of this important officer, whom we find eſtabliſhed in moſt kingdoms that border on the ſea. But the moſt probable opinion is that of Sir Henry Spelman, who thinks, that both the name and dignity were derived from the Saracens, and, by reaſon of the holy wars, brought into Europe; for *admiral*, in the Arabian language, ſignifies a prince, or chief ruler, and was the ordinary title of the governors of cities, provinces, &c. and therefore they called the commander of the navy by that name, as a name of dignity and honour. And indeed there are no inſtances of admirals in any part of Europe before the year 1284, when Philip of France, who had attended St Lewis in the wars againſt the Saracens, created an admiral. Du Cange aſſures us, that the Sicilians were the firſt, and the Genoeſe the next, who gave the denomination of *Admiral* to the commander of their naval armaments; and that they took it from the Saracen or Arabic *Emir*, a general name for every commanding officer. As for the exact time when the word was introduced in England, it is uncertain; ſome think it was in the reign of

Edward I. Sir Henry Spelman is of opinion that it was firſt uſed in the reign of Henry III. becauſe neither the laws of Oleron made in 1266, nor Bracton, who wrote about that time, make any mention of it; and that the term *admiral* was not uſed by a charter in the eighth of Henry III. wherein he granted this office to Richard de Lacey, by theſe words *Maritimam Angliæ;* but in the 56th year of the ſame reign, not only the hiſtorians, but the charters themſelves, very frequently mention the word *admiral.*

Anciently there were generally three or four admirals appointed in the Engliſh ſeas, all of them holding the office *durante bene placito;* and each of them having particular limits under their charge and government; as admirals of the fleet of ſhips, from the mouth of the Thames northward, ſouthward, or weſtward. Beſides theſe, there were admirals of the Cinque Ports, as in the reign of Edward III. when one William Latimer was ſtyled *admiralis quinque portuum;* and we ſometimes find that one perſon has been admiral of the fleets to the ſouthward, northward, and weſtward: but the title of *admiralis Angliæ* was not frequent till the reign of Henry IV. when the king's brother had that title given him, which in all commiſſions afterwards was granted to the ſucceeding admirals. It may be obſerved, that there was a title above that of admiral of England, which was *locum-tenens regis ſuper mare,* the king's lieutenant-general of the ſea; this title we find mentioned in the reign of Richard II.—Before the uſe of the word *admiral* was known, the title of *cuſtos maris* was made uſe of.

Lord High ADMIRAL *of England,* in ſome ancient records called *capitanus maritimarum,* an officer of great antiquity and truſt, as appears by the laws of Oleron, ſo denominated from the place they were made at by Richard I. The firſt title of *Admiral of England,* expreſsly conferred upon a ſubject, was given by patent of Richard II. to Richard Fitz-Allen, jun. earl of Arundel and Surry; for thoſe who before enjoyed this office were ſimply termed *admirals,* though their juriſdiction ſeems as large, eſpecially in the reign of Edward III. when the court of admiralty was firſt erected.

This great officer has the management of all maritime affairs, and the government of the royal navy, with power of deciſion in all maritime caſes both civil and criminal: he judges of all things done upon or beyond the ſea, in any part of the world; upon the ſea-coaſts, in all ports and havens, and upon all rivers below the firſt bridge from the ſea. By him, vice-admirals, rear-admirals, and all ſea-captains, are commiſſioned; all deputies for particular coaſts, and coroners to view dead bodies found on the ſea-coaſts, or at ſea: he alſo appoints the judges for his court of admiralty, and may impriſon, releaſe, &c. All ports and havens are *infra corpus comitatus,* and the admiral hath no juriſdiction of any thing done on them. Between high and low water-mark, the common-law and the high-admiral have juriſdiction by turns, one upon the water, and the other upon the land.

The lord-admiral has power, not only over the ſeamen ſerving in his ſhips of war, but over all other ſeamen, to arreſt them for the ſervice of the ſtate; and, if any of them run away, without leave of the admiral, he hath power to make a record thereof, and certify the ſame to the ſheriffs, mayors, bailiffs, &c. who ſhall cauſe them to be apprehended and impriſoned.

To the lord high-admiral belong all penalties and amercements of all tranſgreſſions at ſea, on the ſea-ſhore, in ports and havens, and all rivers below the firſt bridge from the ſea; the goods of pirates and felons condemned or enſlaved, ſea-wrecks, goods floating on the ſea, or caſt on the ſhore (not granted to lords of manors adjoining to the ſea), and a ſhare of lawful prizes; alſo all great fiſhes, commonly called *royal fiſhes,* except whales and ſturgeons: to which add, a ſalary of 7000*l.* a-year.

In ſhort, this is ſo great an office, in point of truſt, honour, and profit, that it has been uſually given to princes of the blood, or the moſt eminent perſons among the nobility. There has been no high admiral for ſome years; the office being put in commiſſion, or under the adminiſtration of the lords commiſſioners of the admiralty, who by ſtatute have the ſame power and authority as the lord high admiral.

Lord High ADMIRAL *of Scotland,* one of the great officers of the crown, and ſupreme judge in all maritime caſes within that part of Britain. See LAW, Part III. Nº clvii. 15.

ADMIRAL, alſo implies the commander in chief of any ſingle fleet or ſquadron; or, in general, any flag-officer whatever. The commander of a fleet carries his flag at the main-top-maſt head.

Vice ADMIRAL, is the commander of the ſecond ſquadron, and carries his flag at the fore-top-maſt head.

Rear ADMIRAL, is the commander of the third ſquadron, and carries his flag at the mizen-top-maſt head.

Vice ADMIRAL, is alſo an officer appointed by the lords commiſſioners of the admiralty. There are ſeveral of theſe officers eſtabliſhed in different parts of Great Britain, with judges and marſhals under them, for executing juriſdiction within their reſpective limits. Their decrees, however, are not final, an appeal lying to the court of admiralty in London.

ADMIRAL is alſo an appellation given to the moſt conſiderable ſhip of a fleet of merchant-men, or of the veſſels employed in the cod-fiſhery of Newfoundland. This laſt has the privilege of chooſing what place he pleaſes on the ſhore to dry his fiſh; gives proper orders, and appoints the fiſhing-places to thoſe who come after him; and as long as the fiſhing ſeaſon continues, he carries a flag on his main-maſt.

ADMIRAL, in zoology, the Engliſh name of a ſpecies of the voluta, a ſhell-fiſh belonging to the order of vermes teſtacea. See VOLUTA.

ADMIRALTY properly ſignifies the office of lord high-admiral, whether diſcharged by one ſingle perſon, or by joint commiſſioners called *lords of the admiralty.*

Court of ADMIRALTY, is a ſovereign court held by the lord high-admiral, or lords of the admiralty, where cognizance is taken in all maritime affairs, whether civil or criminal.—All crimes committed on the high-ſeas, or on great rivers below the firſt bridge next the ſea, are cognizable in this court only, and before which they muſt be tried by judge and jury. But in civil caſes the mode is different, the deciſions being all made according to the civil law. From the ſentences of the admiralty-judge an appeal always lay, in ordinary courſe, to the king in chancery, as may be collected from ſtatute 25 Henry VIII. c. 19. which directs the appeal from the archbiſhop's courts to be determined by perſons named in the king's commiſſion, “ like as in "caſe of appeal from the admiral-court." But this is alſo expreſsly declared by ſtatute 8 Eliz. c. 5. which enacts, that upon an appeal made to the chancery, the ſentence definitive of the delegates appointed by commiſſion ſhall be final.

Appeals from the vice-admiralty courts in America, and other plantations and ſettlements, may be brought before the courts of admiralty in England, as being a branch of the admiral's juriſdiction, tho' they may alſo be brought before the king in council. But in caſe of prize-veſſels, taken in time of war, in any part of the world, and condemned in any courts of admiralty or vice-admiralty as lawful prize, the appeal lies to certain *commiſſioners of appeals* conſiſting chiefly of the privy council, and not to judges delegates. And this by virtue of divers treaties with foreign nations, by which particular courts are eſtabliſhed in all the maritime countries of Europe for the deciſion of this queſtion, Whether lawful prize or not? for this being a queſtion between ſubjects of different ſtates, it belongs entirely to the law of nations, and not to the municipal laws of either country, to determine it.

Court of ADMIRALTY in Scotland. See LAW, Part III. N° clvii. 15.

ADMIRALTY Iſlands, lie in about 2° 18′ S. Lat. and 146° 44′ E. Long. There are between 20 and 30 iſlands ſaid to be ſcattered about here, one of which alone would make a large kingdom. Captain Carteret, who firſt diſcovered them, was prevented touching at them, although their appearance was very inviting, on account of the condition of his ſhip, and of his being entirely unprovided with the articles of barter which ſuit an Indian trade. He deſcribes them as clothed with a beautiful verdure of woods, lofty and luxuriant, interſperſed with ſpots that have been cleared for plantations, groves of cocoa nut-trees, and houſes of the natives, who ſeem to be very numerous. The largeſt of theſe iſlands is 18 leagues long in the direction of eaſt and weſt. The diſcoverer thinks it highly probable that theſe iſlands produce ſeveral valuable articles of trade, particularly ſpices, as they lie in the ſame climate and latitude as the Moluccas.

ADMONITION, in eccleſiaſtical affairs, a part of diſcipline much uſed in the ancient church. It was the firſt act, or ſtep, towards the puniſhment or expulſion of delinquents. In caſe of private offences, it was performed according to the evangelical rule, privately: in caſe of public offence, openly, before the church. If either of thoſe ſufficed for the recovery of the fallen perſon, all further proceedings in the way of cenſure ceaſed; if they did not, recourſe was had to excommunication.

ADMONITIO Fuſtium, among the Romans, a military puniſhment, not unlike our whipping, only it was performed with vine-branches.

ADMORTIZATION, in the feudal cuſtoms, the reduction of the property of lands or tenements to mortmain. See MORTMAIN.

ADNATA, in anatomy, one of the coats of the eye, which is alſo called *conjunctiva* and *albuginea.*

ADNATA, is alſo uſed for any hair, wool, or the like, which grows upon animals or vegetables.

ADNATA, or *Adnaſcentia,* among gardeners, denote thoſe off-ſets, which, by a new germination under the earth, proceed from the lily, narciſſus, hyacinth, and other flowers, and afterwards grow to true roots. The French call them *cayeux,* "ſtalks."

ADNOUN, is uſed by ſome grammarians to expreſs what we more uſually call an Adjective. The word is formed by way of analogy to adverb; in regard adjectives have much the ſame office and relation to nouns that adverbs have to verbs. Biſhop Wilkins uſes the word *adname* in another ſenſe, *viz.* for what we otherwiſe call a prepoſition.

ADOLESCENCE, the ſtate of growing youth; or that period of a perſon's age commencing from his infancy, and terminating at his full ſtature or manhood. The word is formed of the Latin *adoleſcere,* to grow.—The ſtate of adoleſcence laſts ſo long as the fibres continue to grow, either in magnitude or firmneſs. The fibres being arrived at the degree of firmneſs and tenſion ſufficient to ſuſtain the parts, no longer yield or give way to the efforts of the nutritious matter to extend them; ſo that their farther accretion is ſtopped, from the very law of their nutrition. Adoleſcence is commonly computed to be between 15 and 25, or even 30 years of age; though in different conſtitutions its terms are very different.—The Romans uſually reckoned it from 12 to 25 in boys; and to 21 in girls, &c. And yet, among their writers, *juvenis* and *adoleſcens* are frequently uſed indifferently for any perſon under 45 years.

ADOLLAM, or ODOLLAM (anc. geog.), a town in the tribe of Judah, to the eaſt of Eleutheropolis. David is ſaid to have hid himſelf in a cave near this town, (Bible.)

ADON, a populous village in the province of Stuhl-Weiſſemberg, belonging to Hungary. It lies in a fruitful country, towards the river Danube. Long. 19. 20. Lat. 47. 30.

ADONAI, one of the names of the Supreme Being in the ſcriptures. The proper meaning of the word is *my lords,* in the plural number; as *Adoni* is *my lord,* in the ſingular. The Jews, who either out of reſpect, or ſuperſtition, do not pronounce the name of *Jehovah,* read *Adonai* in the room of it, as often as they meet with Jehovah in the Hebrew text. But the ancient Jews were not ſo ſcrupulous; nor is there any law which forbids them to pronounce the name of God. Calmet.

ADONIA, in antiquity, ſolemn feaſts in honour of Venus, and in memory of her beloved Adonis. The Adonia were obſerved with great ſolemnity by moſt nations; Greeks, Phœnicians, Lycians, Syrians, Egyptians, &c. From Syria, they are ſuppoſed to have paſſed into India. The prophet Ezekiel* is underſtood to ſpeak of them. They were ſtill obſerved at Alexandria in the time of St Cyril; and at Antioch in that of Julian the apoſtate, who happened to enter that city during the ſolemnity, which was taken for an ill omen. The Adonia laſted two days: on the firſt of which certain images of Venus and Adonis were carried, with all the pomp and ceremonies practiſed at funerals; the women wept, tore their hair, beat their breaſts, &c. imitating the cries and lamentations of Venus for the death of her paramour. This lamentation they called Αδωνιασμος. The Syrians were not contented with weeping, but gave themſelves diſcipline, ſhaved their heads, &c. Among the Egyptians, the queen herſelf uſed to carry the image of Adonis in proceſſion. St Cyril mentions an extraordinary ceremony practiſed by the Alexandrians: A letter was written to the women of Byblus, to inform them that Adonis,

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* Ch. viii. 14.

Adonis was found again: this letter was thrown into the ſea, which (it was pretended) did not fail punctually to convey it to Bybulus in ſeven days; upon the receipt of which, the Byblian women ceaſed their mourning, ſung his praiſes, and made rejoicings as if he were raiſed to life again: Or rather, according to Meurſius, the two officers of mourning and rejoicing made two diſtinct feaſts, which were held at different times of the year, the one ſix months after the other; Adonis being ſuppoſed to paſs half the year with Proſerpine, and half with Venus.—The Egyptian Adonia are ſaid to have been held in memory of the death of Oſiris; by others, of his ſickneſs and recovery. Biſhop Patrick dates their origin from the ſlaughter of the firſt-born under Moſes.

ADONIDES, in botany, a name given to botaniſts who deſcribed or made catalogues of plants cultivated in any particular place.

ADONIS, ſon to Cinyras king of Cyprus, the darling of the goddeſs Venus: being killed by a wild boar in the Indian woods, he was turned into a flower of a blood-colour, ſuppoſed to be the Anemone. Venus was inconſolable; and no grief was ever more celebrated than this, moſt nations having perpetuated the memory of it by a train of anniverſary ceremonies.* Among Shakeſpeare's poems, is a long one on the ſubject of Venus's affection for Adonis.

The text of the vulgate in Ezekiel, viii. 14. ſays, that this prophet ſaw women ſitting in the temple, and weeping for Adonis: but according to the reading of the Hebrew text, they are ſaid to weep for Tammuz, or the *hidden one*. Among the Egyptians, Adonis was adored under the name of Oſiris the huſband of Iſis. But he was ſometimes called by the name of Ammuz, or Tammuz, *the concealed*, to denote probably his death or burial. The Hebrews, in deriſion, call him ſometimes the *dead*, Pſal. cvi. 28. and Lev. xix. 28. becauſe they wept for him, and repreſented him as one dead in his coffin; and at other times, they call him the image of jealouſy, Ezek. viii. 3. 5. becauſe he was the object of the god Marr's jealouſy. The Syrians, Phœnicians, and Cyprians called him Adonis, and F. Calmet is of opinion, that the Ammonites and Moabites gave him the name of Baal-peor. See Baal-peor.

Adonis, *Adonius*, (anc. geog.); a river of Phœnicia, riſing in mount Lebanon, and falling into the ſea, after a north-weſt courſe, at Bybulus; famous in fable, as a beautiful ſhepherd youth, (Virgil); ſon of Cynaras, king of the Cyprians, loved by Venus, ſlain by a boar, and turned into a river. Theocritus laments him dead in an idyllion, or rather ode, as did the women yearly, when in flood-time, the river rolled down a red earth, which tinged its waters, deemed to be his wound bleeding afreſh. In the Phœnician language Adan ſignifies a willow, and Adon lord, with the ſame radical letters. Hence Ιταιος Αδωνις, Salignus, and Κυρις, or Κιρις Αδωνις, for Κυριος. Adonidis horti, are gardens beautifully arranged, but more adapted for pleaſure than profit.

Adonis, *Birds-eye*, or *Pheaſants-eye*; a genus of the polyandria order, belonging to the polygynia claſs of plants. It is aſſociated with the *Multiſiliquæ*, or 26th Nat. Order.—The characters are: The *calyx* is a perianthium, conſiſting of five obtuſe concave leaves, ſomewhat coloured, and deciduous. The *corolla* has from five to fifteen oblong petals obtuſe and gloſſy. The *ſtamina* conſiſt of very numerous, ſhort, ſubulated filaments; the antheræ are oblong and inflected. The *piſtillum* has numerous germina collected in a head; no ſtyli; the ſtigmata acute and reflected. There is no *pericarpium*; the receptacle is oblong and ſpiked. The *ſeeds* are numerous, irregular, angular, gibbous at the baſe, reflected at the top, ſomewhat prominent, and awnleſs.

Species. The moſt remarkable ſpecies are the following: 1. The annua, or common adonis, is a native of Kent, where it is found in great plenty in the fields ſown with wheat. Its flowers are of a beautiful ſcarlet colour, and appear in the beginning of June; the ſeeds ripening in Auguſt and September. Great quantities of theſe flowers are ſold in London under the name of Red Morocco. 2. The æſtivalis, or annual adonis, with yellow flowers, grows much taller than the firſt, has its leaves thinner ſet, and of a lighter colour. 3. The vernalis, or perennial adonis, grows naturally on the mountains of Bohemia, Pruſſia, and other parts of Germany. It flowers the latter end of March, or beginning of April; the ſtalks riſe about a foot and a half high; and when the roots are large, and have ſtood unremoved for ſome years, they will put out a great number of ſtalks from each root; on the top of each of theſe grows one large yellow flower. 4. The apennina, is a native of Siberia and the Appenines.

Culture. The firſt two ſpecies, being annual, muſt be propagated from ſeeds, which ought to be ſown in autumn, ſoon after they are ripe, or they will be in danger of not growing up that year. They thrive beſt in a light ſoil. The third and fourth ſpecies are likewiſe to be propagated from ſeeds, which muſt be ſown in autumn, or they ſeldom ſucceed. When the plants come up, they muſt be carefully kept clear from weeds; and in very dry weather their growth will be promoted by being now and then watered. They ſhould remain in the place where they are ſown till the ſecond year; and be tranſplanted thence in autumn, to the place where they are to remain.

ADONISTS, a ſect or party, among Divines and Critics, who maintain that the Hebrew points ordinarily annexed to the conſonants of the word Jehovah, are not the natural points belonging to that word, nor expreſs the true pronunciation of it; but are the vowel-points, belonging to the words *Adonai* and *Elohim*, applied to the conſonants of the ineffable name Jehovah; to warn the readers, that inſtead of the word Jehovah, which the Jews were forbid to pronounce, and the true pronunciation of which had been long unknown to them, they are always to read *Adonai*. They are oppoſed to *Jehoviſts*; of whom the principal are Druſius, Capellus, Buxtorf, Alting, and Reland, who has publiſhed a collection of their writings on this ſubject.

ADOPTIANI, in church-hiſtory, a ſect of ancient heretics, followers of Felix of Urgel, and Elipand of Toledo, who, towards the end of the eighth century, advanced the notion, that Jeſus Chriſt, in his human nature, is the ſon of God, not by nature, but by adoption.

ADOPTION, an act by which any one takes another into his family, owns him for his ſon, and appoints him for his heir.

The cuſtom of adoption was very common among the ancient Greeks and Romans: yet it was not practiſed, but for certain cauſes expreſſed in the laws, and with certain formalities uſual in ſuch caſes. It was a ſort of imitation of nature, intended for the comfort of thoſe who had no children: wherefore he that was to adopt was to have no children of his own, and to be paſt the age of getting any; nor were eunuchs allowed to adopt, as being under an actual impotency of begetting children; neither was it lawful for a young man to adopt an elder, becauſe that would have been contrary to the order of nature; nay, it was even required that the perſon who adopted ſhould be eighteen years older than his adopted ſon, that there might at leaſt appear a probability of his being the natural father.

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* See *Adonia*.

Among the Greeks it was called ὑιοτης, *filiation.* It was allowed to ſuch as had no iſſue of their own; excepting thoſe who were not κυριοι εαυτων, *their own maſters*, e. g. ſlaves, women, madmen, infants, or perſons under twenty years of age; who being incapable of making wills, or managing their own eſtates, were not allowed to adopt heirs to them. Foreigners being incapable of inheriting at Athens, if any ſuch were adopted, it was neceſſary firſt to make them free of the city. The ceremony of adoption being over, the adopted had his name inrolled in the tribe and ward of his new father; for which entry a peculiar time was allotted, viz. the feſtival θαργηλια. To prevent raſh and inconſiderate adoptions, the Lacedæmonians had a law, that adoptions ſhould be tranſacted, or at leaſt confirmed, in the preſence of their kings. The children adopted were inveſted with all the privileges, and obliged to perform all the duties, of natural children: and being thus provided for in another family, ceaſed to have any claim of inheritance, or kindred, in the family which they had left, unleſs they firſt renounced their adoption; which, by the laws of Solon, they were not allowed to do, unleſs they had firſt begotten children, to bear the name of the perſon who had adopted them: thus providing againſt the ruin of families, which would otherwiſe have been extinguiſhed by the deſertion of thoſe who had been adopted to preſerve them. If the children adopted happened to die without children, the inheritance could not be alienated from the family into which they had been adopted, but returned to the relations of the adopter. It ſhould ſeem, that by the Athenian law, a perſon, after having adopted another, was not allowed to marry without permiſſion from the magiſtrate: in effect, there are inſtances of perſons, who being ill uſed by their adoptive children, petitioned for ſuch leave. However this be, it is certain ſome men married after they had adopted ſons: in which caſe, if they begat legitimate children, their eſtates were equally ſhared between the begotten and adopted.

The Romans had two forms of adoption; one before the prætor; the other at an aſſembly of the people, in the times of the commonwealth, and afterwards by a reſcript of the Emperor. In the former, the natural father addreſſed himſelf to the prætor, declaring that he emancipated his ſon, reſigned all his authority over him, and conſented he ſhould be tranſlated into the family of the adopter. The latter was practiſed, where the party to be adopted was already free; and this was called *adrogation.* The perſon adopted changed all his names: aſſuming the prename, name, and ſurname, of the perſon who adopted him.

Beſides the formalities preſcribed by the Roman law, various other methods have taken place; which have given denominations to different ſpecies of adoption, among the Gothic nations, in different ages. As,

ADOPTION by arms, was when a prince made a preſent of arms to a perſon, in conſideration of his merit and valour. Thus it was that the king of the Heruli was adopted by Theodoric; Athalaric by the emperor Juſtinian; and Coſroes, nephew of the king of Perſia, by the emperor Juſtin.—The obligation here laid on the adoptive ſon was, to protect and defend the father from injuries, affronts, &c. And hence, according to Selden, the ceremony of dubbing knights took its origin as well as name.

ADOPTION by baptiſm, is that ſpiritual affinity which is contracted by god-fathers and god-children in the ceremony of baptiſm. This kind of adoption was introduced into the Greek church, and came afterwards into uſe among the ancient Franks, as appears by the Capitulars of Charlemagne.

In reality, the god-father was ſo far conſidered as adoptive father, that his god-children were ſuppoſed to be intitled to a ſhare in the inheritance of his eſtate.

ADOPTION by hair, was performed by cutting off the hair of a perſon, and giving it to the adoptive father. It was thus that pope John VIII. adopted Boſon king of Arles; which, perhaps, is the only inſtance in hiſtory, of adoption, in the order of the eccleſiaſtics; a law that profeſſes to imitate nature, not daring to give children to thoſe in whom it would be thought a crime to beget any.

ADOPTION by matrimony, is the taking the children of a wife or huſband, by a former marriage, into the condition of proper or natural children; and admitting them to inherit on the ſame footing with thoſe of the preſent marriage. This is a practice peculiar to the Germans; among whom, it is more particularly known by the name of *einkindſchaft;* among their writers in Latin, by that of *unio prolium*, or *union of iſſues.* But the more accurate writers obſerve, that this is no adoption. See ADFILIATION.

ADOPTION by teſtament, that performed by appointing a perſon heir by will, on condition of his aſſuming the name, arms, &c. of the adopter. Of which kind we meet with ſeveral inſtances in the Roman hiſtory.

Among the Turks, the ceremony of adoption is performed by obliging the perſon adopted to paſs through the ſhirt of the adopter. Hence, among that people, to adopt is expreſſed by the phraſe, *to draw another through my ſhirt.* It is ſaid, that ſomething like this has alſo been obſerved among the Hebrews; where the prophet Elijah adopted Eliſha for his ſon and ſucceſſor, and communicated to him the gift of prophecy, by letting fall his cloak or mantle on him. But adoption, properly ſo called, does not appear to have been practiſed among the ancient Jews; Moſes ſays nothing of it in his laws; and Jacob's adoption of his two grandſons, Ephraim and Manaſſeh, is not ſo properly an adoption, as a kind of ſubſtitution, whereby thoſe two ſons of Joſeph were allotted an equal portion in Iſrael with his own ſons.

ADOPTION is alſo uſed, in theology, for a federal act of God's free grace; whereby thoſe who are regenerated by faith, are admitted into his houſhold, and intitled to a ſhare in the inheritance of the kingdom of heaven.

Adoption is ſometimes alſo uſed, in ſpeaking of the ancient clergy, who had a cuſtom of taking a maid or widow into their houſes, under the denomination of an *adoptive*, or *ſpiritual ſiſter* or *niece*.

Adoption is alſo uſed in ſpeaking of the admiſſion of perſons into certain hoſpitals, particularly that of Lyons; the adminiſtrators whereof have all the power and rights of parents over the children admitted.

Adoption is alſo uſed for the reception of a new academy into the body of an old one.—Thus

The French academy at Marſeilles was adopted by that of Paris; on which account, we find a volume of ſpeeches extant, made by ſeveral members of the academy of Marſeilles, deputed to return thanks to that of Paris for the honour.

In a ſimilar ſenſe, adoption is alſo applied by the Greeks, to the admitting a monk, or brother into a monaſtic community; ſometimes called *ſpiritual adoption*.

ADOPTIVE, denotes a perſon or thing adopted by another.

Adoptive children, among the Romans, were on the ſame footing with natural ones; and accordingly were either to be inſtituted heirs, or expreſsly diſinherited, otherwiſe the teſtament was null. The emperor Adrian preferred adoptive children to natural ones; becauſe we chooſe the former, but are obliged to take the latter at random.

M. Menage has publiſhed a book of eloges, or verſes addreſſed to him; which he calls *Liber Adoptivus*, an adoptive book; and adds it to his other works.—Heinſius, and Furſtemburg of Munſter, have likewiſe publiſhed adoptive books.

In eccleſiaſtical writers we find adoptive women, or ſiſters, (*adoptivæ fœminæ*, or *ſorores*,) uſed for thoſe handmaids of the ancient clergy, otherwiſe called *ſubintroductæ*.

Adoptive arms are thoſe which a perſon enjoys by the gift or conceſſion of another, and to which he was not otherwiſe intitled. They ſtand contradiſtinguiſhed from arms of alliance.

We ſometimes meet with adoptive hair, by way of oppoſition to natural hair; and adoptive gods, by way of contradiſtinction to domeſtic ones. The Romans, notwithſtanding the number of their domeſtic, had their adoptive gods, taken chiefly from the Egyptians: ſuch were Iſis, Oſiris, Anubis, Apis, Harpocrates, and Canopus.

ADORATION, the act of rendering divine honours; or of addreſſing a being, as ſuppoſing it a god. The word is compounded of *ad*, "to;" and *os*, *oris*, "mouth;" and literally ſignifies, to apply the hand to the mouth; *Manum ad os admovere*, *q. d.* "to kiſs the hand;" this being, in the eaſtern countries, one of the great marks of reſpect and ſubmiſſion.—The Romans practiſed adoration at ſacrifices, and other ſolemnities; in paſſing by temples, altars, groves, &c.; at the ſight of ſtatues, images or the like, whether of ſtone or wood, wherein any thing of divinity was ſuppoſed to reſide. Uſually there were images of the gods placed at the gates of cities, for thoſe who went in or out, to pay their reſpects to.—The ceremony of adoration among the ancient Romans was thus: The devotee having his head *covered*, applied his right hand to his lips, the fore-finger reſting on his thumb, which was erect, and thus bowing his head, turned himſelf round from left to right. The kiſs thus given was called *oſculum labratum*; for ordinarily they were afraid to touch the images of their gods themſelves with their profane lips. Sometimes, however, they would kiſs their feet, or even knees, it being held an incivility to touch their mouths; ſo that the affair paſſed at ſome diſtance. Saturn, however, and Hercules, were adored with the head *bare*; whence the worſhip of the laſt was called *inſtitutum peregrinum*, and *ritus Græcanicus*, as departing from the cuſtomary Roman method, which was to ſacrifice and adore with the face veiled, and the cloaths drawn up to the ears, to prevent any interruption in the ceremony by the ſight of unlucky objects.—The Jewiſh manner of adoration was by proſtration, bowing, and kneeling.—The Chriſtians adopted the Grecian rather than the Roman method, and adored always *uncovered*. The ordinary poſture of the ancient Chriſtians was kneeling, but on Sundays ſtanding: and they had a peculiar regard to the Eaſt, to which point they ordinarily directed their prayers.

Adoration is more particularly uſed for the act of praying, or preferring our requeſts or thankſgiving, to Almighty God.

Adoration is alſo uſed for certain extraordinary civil honours or reſpects which reſemble thoſe paid to the deity, yet are given to men.

The Perſian manner of *Adoration*, introduced by Cyrus, was by bending the knee, and falling on the face at the prince's feet, ſtriking the earth with the forehead, and kiſſing the ground. This ceremony, which the Greeks called προσκυνειν, Conon refuſed to perform to Artaxerxes, and Caliſthenes to Alexander the great, as reputing it impious and unlawful.

The *Adoration* performed to the Roman and Grecian emperors conſiſted in bowing or kneeling at the prince's feet, laying hold of his purple robe, and preſently withdrawing the hand and clapping it to the lips. Some attribute the origin of this practice to Conſtantius. It was only perſons of ſome rank or dignity that were intitled to the honour. Bare kneeling before the emperor to deliver a petition, was alſo called *adoration*.

The practice of *adoration* may be ſaid to be ſtill ſubſiſting in England, in the ceremony of kiſſing the king's or queen's hand, and in ſerving them at table, both being performed kneeling.

Adoration is more particularly uſed for kiſſing one's hand in preſence of another, as a token of reverence.—The Jews adored by kiſſing their hands and bowing down their heads; whence, in their language, *kiſſing* is properly uſed for *adoration*.

Adoration is alſo uſed among Roman writers for a high ſpecies of applauſe given to perſons, who had ſpoken or performed well in public. (See Acclamation.) We meet with adoration paid to orators, actors, muſicians, &c. The method of expreſſing it was, by riſing, putting both hands to their mouth, and then returning them towards the perſon intended to be honoured.

Adoration is alſo uſed, in the court of Rome, for the ceremony of kiſſing the Pope's feet.—The introduction of adoration among the Romans is aſcribed to the low flattery of Vitellius, who, upon the return of C. Cæſar from Syria, would not approach him otherwiſe than with his head covered, turning himſelf round, and then falling on his face. Heliogabulus reſtored the practice, and Alexander Severus again prohibited it. Dioclesian redemanded it; and it was, in ſome meaſure, continued under the ſucceeding princes, even after the eſtabliſhment of Chriſtianity, as Conſtantine, Conſtantius, &c. It is particularly ſaid of Diocleſian, that he had gems faſtened to his ſhoes, that divine honours might be more willingly paid him, by kiſſing his feet. The like uſage was afterwards adopted by the popes, and is obſerved to this day. Theſe prelates, finding a vehement diſpoſition in the people to fall down before them and kiſs their feet, procured crucifixes to be faſtened on their ſlippers; by which ſtratagem, the adoration intended for the pope's perſon is ſuppoſed to be transferred to Chriſt. Divers acts of this adoration we find offered even by princes to the pope.

Adoration is alſo uſed for a method of electing a pope. The election of popes is performed two ways; by *adoration*, and by *ſcrutiny*. In election by adoration, the cardinals ruſh haſtily, as if agitated by ſome ſpirit, to the adoration of ſome one among them, to proclaim him pope. When the election is carried by ſcrutiny, they do not adore the new pope till he is placed on the altar.

Barbarous Adoration is a term uſed, in the laws of king Canute, for that performed after the manner of the heathens who adored idols. The Romiſh church is charged with the adoration of ſaints, martyrs, images, crucifixes, relics, the virgin, and the hoſt; all which by Proteſtants are generally aggravated into idolatry, on a ſuppoſition, that the honour thus paid to them is abſolute and ſupreme, called by way of diſtinction *Latria*, which is due only to God. Roman-catholics, on the contrary, explain them, as only a relative or ſubordinate worſhip, called *Dulia* and *Hyperdulia*, which terminates ultimately in God alone. But may not the ſame be ſaid of the idol-worſhip of the heathens? The Phœnicians adored the winds, on account of the terrible effects produced by them; the ſame was adopted by moſt of the other nations, Perſians, Greeks, Romans, &c. The Perſians chiefly paid their adorations to the ſun and fire; ſome ſay alſo to rivers, the wind, &c. The motive of adoring the ſun was the benefits they received from that glorious luminary, which of all creatures has doubtleſs the beſt pretenſions to ſuch homage.

ADOREA, in Roman antiquity, a word uſed in different ſenſes; ſometimes for all manner of grain, ſometimes for a kind of cakes made of fine flour, and offered in ſacrifice; and finally for a dole or diſtribution of corn, as a reward for ſome ſervice; whence by metonymy it is put for praiſe or rewards in general.

ADOSCULATION, a term uſed by Dr Grew, to imply a kind of impregnation, without intromiſſion; and in this matter he ſuppoſes the impregnation of plants is effected by the falling of the farina fœcundans on the piſtil.

ADOSEE, in heraldry, ſignifies two figures or bearings being placed back to back.

ADOUR, the name of a river of France, which riſes in the mountains of Bigorre, and running N. by Tarbes through Gaſcony, afterwards turns E. and, paſſing by Dax, falls into the bay of Biſcay, below Bayonne.

ADOXA, Tuberous Moschatel, Hollow-root, or Inglorious; a genus of the tetragynia order, belonging to the octandria claſs of plants. In the natural method it belongs to the 13th order, or *Succulentæ*.—The characters of this genus are: The *calyx* is a perianthium beneath, divided into two ſegments, flat, perſiſtent. The *corolla* is compoſed of one flat petal, divided into four ovate acute ſegments longer than the calyx. The *ſtamina* conſiſt of eight ſubulated filaments the length of the calyx; with roundiſh antheræ. The *piſtillum* has a germen beneath the receptacle of the corolla; four ſimple, erect, perſiſtent ſtyli, the length of the ſtamina; and ſimple ſtigmata. The *pericarpium* is a globular four-celled berry between the calyx and corolla. The *ſeeds* are ſolitary and compreſſed.

There is but one ſpecies, which is a native of the woods in Britain, and ſeveral parts of Europe: it is a very low plant, ſeldom riſing more than four or five inches high; the leaves reſemble thoſe of bulbous fumitory; the flower-ſtalk ariſes immediately from the root, on the top of which grow four or five ſmall flowers of an herbaceous white colour, which appear in the beginning of April, and the berries ripen in May; ſoon after which, the leaves decay. The herb may be procured by tranſplanting the roots any time after the leaves decay, till winter. They muſt be planted in the ſhade, under ſhrubs; for they will not thrive if expoſed to the ſun. The leaves and flowers ſmell like muſk, from whence it has by ſome been called *muſk-crowfoot*.

AD pondus omnium, among phyſicians, an abbreviation in their preſcriptions, ſignifying that the laſt mentioned ingredient is to weigh as much as all the reſt together.

Ad Quod Damnum, in the Engliſh law, a writ directed to the ſheriff, commanding him to inquire into the damage which may befal from granting certain privileges to a place, as a fair, a market, or the like.

ADRACHNE, in botany, a ſpecies of the ſtrawberry-tree. See Arbutus.

ADRAMMELECH, one of the gods of the inhabitants of Sepharvaim, who were ſettled in the country of Samaria, in the room of thoſe Iſraelites who were carried beyond the Euphrates. The Sepharvaites made their children paſs through the fire, in honour of this idol and another called *Anamelech*. It is ſuppoſed, that Adrammelech meant the ſun, and Anamelech the moon: the firſt ſignifies *the magnificent king*; the ſecond *the gentle king*.

ADRAMYTTIUM, (anc. geog.), now *Andramiti*; a town of Myſia Major, at the foot of mount Ida, an Athenian colony, with a harbour and dock near the Caicus. *Adramyttenus* the epithet; as, *Adramyttenus Sinus*, a part of the Egean Sea, on the coaſt of Myſia; *Adramyttenus Convenus*, ſeſſions or aſſizes. The eighth in order of the nine *Conventus Juridici* of the province of Aſia.

ADRANA, a river of Germany, (Polybius); now the Eder, riſing on the borders of the county of Naſſau, to the north-eaſt of, and not far from Dillenburg, running through the landgraviate of Heſſe, the county of Waldeck, by Fritzlar, and then again through the landgraviate, and, together with the Fulda, falling into the Weſer, to the ſouth of, and not far from Caſſel.

ADRANUM, or Hadranum, (anc. geog.), now *Aderno*; a town of Sicily, built by the elder Dionyſius, at the foot of mount Ætna, (Diodorus Siculus), four hundred years before Chriſt. So called from the temple of Adranus, or Hadranus, a god much worſhipped by the Sicilians; with a river of the ſame name, (Stephanus,) now *Fiume d' Aderno*. The inhabitants, *Hadranitani*, and *Adranitæ*.

ADRASTEA, in antiquity, an epithet given to the goddeſs Nemeſis, or Revenge. It was taken from king Adraſtus, who firſt erected a temple to that deity.

Adrastia *Certamina*, in antiquity, a kind of Pythian games, inſtituted by Adraſtus king of Argos, in the year of the world 2700, in honour of Apollo, at Sicyon. Theſe are to be diſtinguiſhed from the Pythian games celebrated at Delphi.

ADRASTUS, king of Argos, ſon of Talaus and Lyſianiſſa, daughter of Polybius king of Sicyon, acquired great honour in the famous war of Thebes, in ſupport of Polynices his ſon-in-law, who had been excluded the ſovereignty of Thebes by Eteocles his brother, notwithſtanding their reciprocal agreement. Adraſtus, followed by Polynices and Tydeus his other ſon-in-law, by Capaneus and Hippomedon his ſiſter's ſons, by Amphiaraus his brother-in-law, and by Parthenopæus, marched againſt the city of Thebes; and this is the expedition of the Seven Worthies, which the poets have ſo often ſung. They all loſt their lives in this war, except Adraſtus, who was ſaved by his horſe called Arion. This war was revived ten years after by the ſons of thoſe deceaſed warriors, which was called the war of the Epigones, and ended with the taking of Thebes. None of them loſt their lives except Ægialeus ſon of Adraſtus; which afflicted him ſo much that he died of grief in Megara, as he was leading back his victorious army.

ADRAZZO, or Ajaccio. The ſame with Adjazzo.

ADRIA, or Hadria (anc. geog.), the name of two towns in Italy. One in the country of the Veneti, on the river Tartarus, between the Padus and the Atheſis, called *Atria* by Pliny and Ptolemy, but *Adrias* by Strabo. Another on the river Vomanus, in the territory of the Piceni, (to which Antonine's Itinerary from Rome is directed), the country of the anceſtors of the emperor Adrian. From which of theſe the Adriatic ſea is denominated, is matter of doubt. A third opinion is, that it is ſo called from Adrias the ſon of Joan, of Italian origin; (Euſtathius in Dionyſium.)

ADRIANUM (or Adriaticum) mare (anc. geog.), now the gulph of Venice, a large bay in the Mediterranean, between Dalmatia, Sclavonia, Greece, and Italy. It is called by the Greeks, Αδριας Κολπος; and *Adria* by the Romans, (as *Arbiter Adriæ Notus*, Hor.) Cicero calls it *Hadrianum Mare*; Virgil has *Hadriaticas Undas*. It is commonly called *Mare Adriaticum*, without any aſpiration; but whether it ought to have one, is a diſpute: if the appellation is from *Hadria*, the town of the Piceni, it muſt be written *Hadriaticum*, becauſe the emperor's name, who thence derives his origin, is on coins and ſtones *Hadrianus*; but if from the town in the territory of Venice, as the more ancient, and of which that of the Piceni is a colony, this will juſtify the common appellation *Adriaticum*.

ADRIAN, or Hadrian, (Publius Ælius), the Roman emperor. He was born at Rome the 24th of January, in the 76th year of Chriſt. His father left him an orphan, at ten years of age, under the guardianſhip of Trajan, and Cœlius Tatianus a Roman knight. He began to ſerve very early in the armies, having been tribune of a legion before the death of Domitian. He was the perſon choſen by the army of Lower Mœſia, to carry the news of Nerva's death to Trajan, ſucceſſor to the empire. He accompanied Trajan in moſt of his expeditions, and particularly diſtinguiſhed himſelf in the ſecond war againſt the Daci; and having before been quæſtor, as well as tribune of the people, he was now ſucceſſively prætor, governor of Pannonia, and conſul. After the ſiege of Atra in Arabia was raiſed, Trajan, who had already given him the government of Syria, left him the command of the army: and at length, when he found death approaching, it is ſaid he adopted him. Adrian, who was then in Antiochia, as ſoon as he received the news thereof, and of Trajan's death, declared himſelf emperor, on the 11th of Auguſt, 117. No ſooner had he arrived at the imperial dignity, than he made peace with the Perſians, to whom he yielded up a great part of the conqueſts of his predeceſſors; and from generoſity, or policy, he remitted the debts of the Roman people, which, according to the calculation of thoſe who have reduced them to modern money, amounted to 22,500,000 golden crowns; and he burnt all the bonds and obligations relating to thoſe debts, that the people might be under no apprehenſions of being called to an account for them afterwards. There are medals in commemoration of this fact, in which he is repreſented holding a flambeau in his hand, to ſet fire to all thoſe bonds which he had made void. He went to viſit all the provinces; and did not return to Rome till the year 118, when the ſenate decreed him a triumph, and honoured him with the title of Father of his country; but he refuſed both, and deſired that Trajan's image might triumph. No prince travelled more than Adrian; there being hardly one province in the empire which he did not viſit. In 120 he went into Gaul; from thence he went over to Britain, in order to ſubdue the Caledonians, who were making continual inroads into the provinces. Upon his arrival they retired towards the north: he advanced however as far as York, where he was diverted from his intended conqueſt by the deſcription ſome old ſoldiers he found there, who had ſerved under Agricola, gave him of the country. In hopes, therefore, of keeping them quiet by enlarging their bounds, he delivered up to the Caledonians all the lands lying between the two Friths and the Tyne; and at the ſame time, to ſecure the Roman province from their future incurſions, built the famous wall which ſtill bears his name (A). Having thus ſettled

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(A) This work, though called by the Roman hiſtorians *murus*, which ſignifies a wall of ſtone, was only compoſed of earth covered with green turf. It was carried on from the Solway Frith, a little weſt of the village of Burgh on the Sands, in as direct a line as poſſible, to the river Tyne on the eaſt, at the place where the tled matters in Britain, he returned to Rome, where he was honoured with the title of Reſtorer of Britain, as appears by ſome medals. He ſoon after went into Spain, to Mauritania, and at length into the Eaſt, where he quieted the commotions raiſed by the Parthians. After having viſited all the provinces of Aſia, he returned to Athens in 125, where he paſſed the winter, and was initiated in the myſteries of Eleuſinian Ceres. He went from thence to Sicily, chiefly to view mount Ætna, contemplate its phenomena, and enjoy the beautiful and extenſive proſpect afforded from its top. He returned to Rome the beginning of the year 129; and, according to ſome, he went again, the ſame year, to Africa; and, after his return from thence, to the Eaſt. He was in Egypt in the year 132, reviſited Syria the year following, returned to Athens in 134, and to Rome in 135. The perſecution againſt the Chriſtians was very violent under his reign; but it was at length ſuſpended, in conſequence of the remonſtrances of Quadrat biſhop of Athens, and Ariſtides, two Chriſtian philoſophers, who preſented the emperor with ſome books in favour of the Chriſtian religion. He conquered the Jews; and, by way of inſult, erected a temple to Jupiter on Calvary, and placed a ſtatue of Adonis in the manger of Bethlehem; he cauſed alſo the images of ſwine to be engraven on the gates of Jeruſalem. At laſt he was ſeized with a dropſy, which vexed him to ſuch a degree, that he became almoſt raving mad. A great number of phyſicians were ſent for, and to the multitude of them he aſcribed his death. He died at Baiæ in the 63d year of his age, having reigned 21 years. The Latin verſes (B) he addreſſed to his ſoul have been much criticiſed and variouſly interpreted. There are ſome fragments of his Latin poems extant, and there are Greek verſes of his in the Anthology. He alſo wrote the hiſtory of his own life: to which, however, he did not chuſe to put his name; but that of Phlegon, one of his freed-men, a very learned perſon, was prefixed to it*. He had great wit, and an extenſive memory. He underſtood the ſciences perfectly well; but was very jealous of others who excelled in them. He was alſo cruel, envious, and laſcivious. Antoninus his ſucceſſor obtained his apotheoſis; and prevented the reſciſſion of his acts, which the ſenate once intended.

*Vide *Spartian, in Adriano.*

ADRIAN IV. (Pope), the only Engliſhman who ever had the honour of ſitting in the papal chair. His name was Nicholas Brekeſpere; and he was born at Langley, near St Alban's, in Hertfordſhire. His father having left his family, and taken the habit of the monaſtery of St Alban's, Nicholas was obliged to ſubmit to the loweſt offices in that houſe for daily ſupport. After ſome time, he deſired to take the habit in that monaſtery, but was rejected by the abbot Richard. Upon this he reſolved to try his fortune in another country, and accordingly went to Paris; where, though in very poor circumſtances, he applied himſelf to his ſtudies with great aſſiduity, and made a wonderful proficiency. But having ſtill a ſtrong inclination to a religious life, he left Paris, and removed to Provence, where he became a regular clerk in the monaſtery of St Rufus. He was not immediately allowed to take the habit; but paſſed ſome time, by way of trial, in recommending himſelf to the monks by a ſtrict attention to all their commands. This behaviour, together with the beauty of his perſon, and prudent converſation, rendered him ſo acceptable to thoſe religious, that after ſome time they intreated him to take the habit of the canonical order. Here he diſtinguiſhed himſelf ſo much by his learning and ſtrict obſervance of the monaſtic diſcipline, that, upon the death of the abbot, he was choſen ſuperior of that houſe; and we are told that he rebuilt that convent. Pope Eugenius III. being appriſed of the great merit of Nicholas, and thinking he might be ſerviceable to the church in a higher ſtation, created him cardinal-biſhop of Alba in 1146. In 1148, his Holineſs ſent him legate to Denmark and Norway; where, by his fervent preaching and diligent inſtructions, he converted thoſe barbarous nations to the Chriſtian faith; and erected Upſal

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the town of Newcaſtle now ſtands; ſo that it muſt have been above 60 Engliſh, and near 70 Roman miles in length. It conſiſted of four parts: 1. The principal *agger*, mound of earth, or rampart, on the brink of the ditch. 2. The ditch on the north ſide of the rampart. 3. Another rampart on the ſouth ſide of the principal one, about five paces diſtant from it. 4. A large rampart on the north ſide of the ditch.—This laſt was probably the military way to the line of forts on this work: it was ſo to thoſe formerly built by Agricola; and if it did not ſerve the ſame purpoſe in this, there muſt have been no military way attending it.—The ſouth rampart might ſerve for an inner defence in caſe the enemy ſhould beat them from any part of the principal rampart, or it might be deſigned to protect the ſoldiers from any ſudden attack of the provincial Britons.—For many ages, this work hath been in ſo ruinous a condition, that it is impoſſible to diſcover its original dimenſions with certainty. From their appearance, it ſeems probable that the principal rampart was at leaſt 10 or 12 feet high, and the ſouth one not much leſs; but the north one was conſiderably lower. From the dimenſions of the ditch taken as it paſſes through a lime-ſtone quarry near Harlow hill, it appears to have been 9 feet deep, and 11 wide at the top, but ſomewhat narrower at the bottom. The north rampart was about 20 feet diſtant from the ditch.

(B) The verſes are theſe:

Animula vagula, blandula,
Hoſpes, comeſque corporis,
Quæ nunc abibis in loca
Pallidula, rigida, nudula,
Nec, ut ſoles, dabis jocos?

Thus tranſlated by Mr Pope:

Ah! fleeting ſpirit! wand'ring fire,
That long has warm'd my tender breaſt,
Muſt thou no more this frame inſpire?
No more a pleaſing cheerful gueſt?
Whither, ah whither art thou flying?
To what dark undiſcover'd ſhore?
Thou ſeem'ſt all trembling, ſhiv'ring, dying,
And wit and humour are no more!

ſal into an archiepiſcopal ſee. When he returned to Rome, he was received by the pope and cardinals with great marks of honour: and Pope Anaſtaſius, who ſucceeded Eugenius, happening to die at this time, Nicholas was unanimouſly choſen to the holy ſee, in November 1154, and he took the name of *Adrian.* When the news of his promotion reached England, King Henry II. ſent Robert abbot of St Alban's, and three biſhops, to Rome, to congratulate him on his election; upon which occaſion Adrian granted very conſiderable privileges to the monaſtery of St Alban's, particularly an exemption from all epiſcopal juriſdiction, excepting to the ſee of Rome. Adrian in the beginning of his pontificate, boldly withſtood the attempts of the Roman people to recover their ancient liberty under the conſuls, and obliged thoſe magiſtrates to abdicate their authority, and leave the government of the city to the pope. In 1155, he drove the heretic Arnaud of Breſſe, and his followers, out of Rome. The ſame year he excommunicated William king of Sicily, who ravaged the territories of the church, and abſolved that prince's ſubjects from their allegiance. About the ſame time, Frederic king of the Romans, having entered Italy with a powerful army, Adrian met him near Sutrium, and concluded a peace with him. At this interview, Frederic conſented to hold the pope's ſtirrup whilſt he mounted on horſeback. After which, his holineſs conducted that prince to Rome, and in St Peter's church placed the imperial crown on his head, to the great mortification of the Roman people, who aſſembled in a tumultuous manner, and killed ſeveral of the Imperialiſts. The next year a reconciliation was brought about between the pope and the Sicilian king, that prince taking an oath to do nothing farther to the prejudice of the church, and Adrian granting him the title of *king of the two Sicilies.* He built and fortified ſeveral caſtles, and left the papal dominions in a more flouriſhing condition than he found them. But notwithſtanding all his ſucceſs, he was extremely ſenſible of the diſquietudes attending ſo high a ſtation; and declared to his countryman John of Saliſbury, that all the former hardſhips of his life were mere amuſement to the misfortunes of the popedom: that he looked upon St Peter's chair to be the moſt uneaſy ſeat in the world; and that his crown ſeemed to be clapped burning on his head*. He died September 1, 1159, in the fourth year and tenth month of his pontificate; and was buried in St Peter's church, near the tomb of his predeceſſor Eugenius. There are extant ſeveral letters, and ſome homilies, written by Pope Adrian.

ADRIAN, cardinal-prieſt, of the title of St Chryſogonus, was a native of Cornetto in Tuſcany. Innocent VIII. ſent him nuncio into Scotland and into France; and after he had been clerk and treaſurer of the apoſtolic chamber, pope Alexander VI. whoſe ſecretary he had been, honoured him with the cardinal's hat. His life was a continued ſcene of odd alterations. He narrowly eſcaped death the day Alexander VI. poiſoned himſelf by miſtake. Afterward he drew upon himſelf the hatred of Julius II. ſo that he was obliged to go and hide himſelf in the mountains of Trent. Having been recalled by Leo X. he was ſo ungrateful, that he engaged in a conſpiracy againſt him. The pope pardoned this fault: but the cardinal not caring to truſt to this, made his eſcape, and it could never be known exactly what was become of him. He was one of the firſt that effectually reformed the Latin ſtyle. He ſtudied Cicero with great ſucceſs, and made many excellent obſervations on the propriety of the Latin tongue. The treatiſe he compoſed *De ſermone Latino,* is a proof of this. He had begun a Latin tranſlation of the Old Teſtament. He wrote *De vera philoſophia:* This treatiſe was printed at Cologn 1548.

ADRIAN VI. (Pope), was born at Utrecht in 1459. His father was not able to maintain him at ſchool, but he got a place at Louvain, in a college in which a certain number of ſcholars were maintained *gratis.* It is reported that he uſed to read in the night-time by the light of the lamps in the churches or ſtreets. He made a conſiderable progreſs in all the ſciences; led an exemplary life; and there never was a man leſs intriguing and forward than he was. He took his degree of doctor of divinity at Louvain; was ſoon after made canon of St Peter's, and profeſſor of divinity at Utrecht, and then dean of St Peters and vice-chancellor of the univerſity. He was obliged to leave an academic life, to be tutor to the archduke Charles. This young prince made no great progreſs under him: however, never was a tutor more conſiderably rewarded; for it was by Charles V's credit he was raiſed to the papal throne. Leo X. had given him the cardinal's hat in 1517. After this pope's death, ſeveral cabals in the conclave ended in the election of Adrian, with which the people of Rome were very much diſpleaſed. He would not change his name, and in every thing he ſhowed a great diſlike for all oſtentation and ſenſual pleaſures, though ſuch an averſion had been long ago out of date. He was very partial to Charles V. and did not enjoy much tranquillity under the triple crown. He lamented much the wicked morals of the clergy, and wiſhed to eſtabliſh a reformation of manners among them. He died Sept. 14. 1523.

ADRIANI (Joanni Battiſta), was born of a patrician family at Florence, in 1511. He wrote a Hiſtory of his own Times in Italian; which is a continuation of Guicciardini, beginning at the year 1536; to which Thuanus acknowledges himſelf greatly indebted: beſides which, he compoſed ſix funeral orations, on the emperor Charles V. and other noble perſonages; and is thought to have been the author of a long letter on ancient painters and ſculptors, prefixed to the third volume of Vaſari. He died at Florence in 1579.

ADRIANISTS, in eccleſiaſtical hiſtory, a ſect of heretics divided into two branches; the firſt were diſciples of Simon Magus, and flouriſhed about the year 34. Theodoret is the only perſon who has preſerved their name and memory; but he gives us no account of their origin. Probably this ſect, and the ſix others which ſprang from the Simonians, took their name from the particular diſciples of Simon. The ſecond were the followers of Adrian Hamſtead, the anabaptiſt; and held ſome particular errors concerning Chriſt.

ADRIANOPLE, a city of Turky in Europe, in the province of Romania, and the ſee of an archbiſhop under the patriarch of Conſtantinople. It is about ſix or ſeven miles in circumference, including the old city and ſome gardens. The moſques and other public buildings are built of ſtone, and are very elegant:

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* Baronius Annal. tom xii. an. 1154

but private houſes in general are meanly built; and the ſtreets are exceeding dirty. The walls and towers are in a great meaſure fallen to decay. However, there is a beautiful bazar, or market, half a mile long, called Ali Baſſa. It is a vaſt arched building, with ſix gates, and 365 well-furniſhed ſhops, kept by Turks, Armenians, and Jews, who pay five crowns a-month for each ſhop. The number of inhabitants of all nations and religions may be about 100,000: proviſions are plenty, and living cheap. The air is wholeſome, and the country very pleaſant in the ſummer-time, on account of the river and ſtreams that run near and about the city; the chief of which is the Mariza. Theſe promote and preſerve the verdure of the gardens, meadows, and fields, for a conſiderable part of the year. In the winter there is plenty of game. Near the principal bazar there is another, about a mile in length, covered with boards, with holes on each ſide to let in the light. It is full of good ſhops, which contain all kinds of commodities. Sultan Selim's moſque ſtands on the ſide of a hill, in the midſt of the city; and hence this magnificent ſtructure may be ſeen on all ſides. Every thing made of gold and ſilver, jewels, piſtols, ſcimetars, &c. are ſold in another part of the city, called by travellers the *bizeſtein*, though it differs little from a bazar. This contains about 200 ſhops, and is covered like the former: but the covering is ſupported by two rows of large pillars. The grand viſier's palace is nothing more than a convenient houſe, after the Turkiſh manner of building. The emperor's ſeraglio is a regular ſtructure, in a plain near the river Tungia. It is two miles in compaſs, and has ſeven gates, beſides thoſe of the gardens, which are ſeveral miles in circumference. The city is governed by a mullah cadi, who has an abſolute authority both in civil and criminal matters. In the time of the plague, or war, the grand ſignior has ſometimes reſided here. The Turks took this city from the Greeks in 1362, and made it the capital of the empire, till Mahomet II. took Conſtantinople in 1453. E. Long. 26. 27. Lat. 41. 41.

ADROGATION, in Roman antiquities, a ſpecies of adoption, whereby a perſon who was capable of chooſing for himſelf was admitted by another into the relation of a ſon. The word is compounded of *ad*, "to," and *rogare*, "to aſk;" on account of a queſtion put in the ceremony of it, Whether the adopter would take ſuch a perſon for his ſon? and another to the adoptive, Whether he conſented to become ſuch a perſon's ſon?

ADSIDELLA, in antiquity, the table at which the flamens ſat during the ſacrifices.

ADSTRICTION, among phyſicians, a term uſed to denote the rigidity of any part.

ADUACA, or ATUACA, anciently a large and famous city of the Tungri; now a ſmall and inconſiderable village, called *Tongeren*, in the biſhopric of Liege, to the north-weſt of the city of Liege, in the territory of Haſpengow, on the rivulet Jecker, that ſoon after falls into the Maeſe. E. Long. 5. 52. Lat. 50. 54.

ADVANCE, in the mercantile line, denotes money paid before goods are delivered, work done, or buſineſs performed.

ADVANCED, in a general ſenſe, denotes ſomething poſted or ſituated before another. Thus,

ADVANCED Ditch, in fortification, is that which ſurrounds the glacis or eſplanade of a place.

ADVANCED Guard, or *Vanguard*, in the art of war, the firſt line or diviſion of an army, ranged or marching in order of battle; or, it is that part which is next the enemy, and marches firſt towards them.

Advanced Guard, is more particularly uſed for a ſmall party of horſe ſtationed before the main-guard.

ADVANCER, among ſportſmen, one of the ſtarts or branches of a buck's attire, between the back antler and the palm.

ADUAR, in the Arabian and Mooriſh cuſtoms, a kind of ambulatory village, conſiſting of tents, which theſe people remove from one place to another, as ſuits their conveniency.

ADVENT, in the calendar, properly ſignifies the approach of the feaſt of the nativity. It includes four ſundays, which begin on St Andrew's day, or on the ſunday before or after it. During advent, and to the end of the octaves of epiphany, the ſolemnizing of marriage is forbid without a ſpecial licenſe. It is appointed to employ the thoughts of Chriſtians on the firſt advent or coming of Chriſt in the fleſh, and his ſecond advent or coming to judge the world. The primitive Chriſtians practiſed great auſterity during this ſeaſon.

AD VENTREM INSPICIENDUM, in law, a writ by which a woman is to be ſearched whether ſhe be with child by a former huſband, on her withholding of lands from the next, failing iſſue of her own body.

ADVENTURE, in a general ſenſe, ſome extraordinary or accidental event. It alſo denotes a hazardous or difficult undertaking.

Bill of ADVENTURE, among merchants, a writing ſigned by a merchant, teſtifying the goods mentioned in it to be ſhipped on board a certain veſſel belonging to another perſon, who is to run all hazards; the merchant only obliging himſelf to account to him for the produce.

ADVENTURE-Bay, in Van Diemen's land. There is a beautiful ſandy beach,* about two miles long, at the bottom of Adventure Bay, formed to all appearance by the particles which the ſea waſhes from a fine white ſand-ſtone. This beach is very well adapted for hauling a ſeine. Behind it is a plain, with a brackiſh lake, out of which we caught, by angling, ſome bream and trout. The parts adjoining the bay are moſtly hilly, and are an entire foreſt of tall trees, rendered almoſt impaſſable by brakes of fern, ſhrubs, &c. The ſoil on the flat land, and on the lower part of the hills, is ſandy, or conſiſts of a yellowiſh earth, and in ſome parts of a reddiſh clay; but further up the hills, it is of a grey tough caſt. This country, upon the whole, bears many marks of being very dry, and the heat appears to be great. No mineral bodies, nor ſtones of any other kind than the white ſand-ſtone, were obſerved by us: nor could we find any vegetables that afforded ſubſiſtence for man. The foreſt-trees are all of one kind, and generally quite ſtraight: they bear cluſters of ſmall white flowers. The principal plants obſerved, are wood-ſorrel, milk-wort, cudweed, bell-flower, gladiolus, ſamphire, and ſeveral kinds of fern: the only quadruped, a ſpecies of opoſſum, about twice the ſize of a large rat. The kangooroo, found further northward in New Holland, may alſo be ſuppoſed to inhabit here, as ſome of the inhabitants had pieces of the ſkin of that animal.

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* Cook's laſt voyage, B. i. ch. 6.

The principal ſorts of birds in the woods are brown hawks or eagles, crows, large pigeons, yellowiſh paroquets, and a ſpecies which we called *motacilla cyanea*, from the beautiful azure colour of its head and neck. On the ſhore were ſeveral gulls, black oyſter-catchers, or ſea-pies, and plovers of a ſtone colour.

The inhabitants ſeemed mild and cheerful, with little of that wild appearance that ſavages in general have. They are almoſt totally devoid of perſonal activity or genius, and are nearly upon a par with the wretched natives of Terra del Fuego. They diſplay, however, ſome contrivance in their method of cutting their arms and bodies in lines of different directions, raiſed above the ſurface of the ſkin. Their indifference for preſents, their general inattention, and want of curioſity, were very remarkable, and teſtified no acuteneſs of underſtanding. Their complexion is a dull black, which they ſometimes heighten by ſmutting their bodies, as was ſuppoſed, from their leaving a mark behind on any clean ſubſtance. Their hair is perfectly woolly, and is clotted with greaſe and red ochre, like that of the Hottentots. Their noſes are broad and full, and the lower part of the face projects conſiderably. Their eyes are of a moderate ſize, and though they are not very quick or piercing, they give the countenance a frank, cheerful, and pleaſing caſt. Their teeth are not very white, nor well ſet, and their mouths are too wide: they wear their beards long, and clotted with paint. They are, upon the whole, well proportioned, though their belly is rather protuberant. Their favourite attitude is to ſtand with one ſide forward, and one hand graſping, acroſs the back, the oppoſite arm, which, on this occaſion, hangs down by the ſide that projects.

ADVENTURER, in a general ſenſe, denotes one who hazards ſomething.

Adventurers, is particularly uſed for an ancient company of merchants and traders, erected for the diſcovery of lands, territories, trades, &c. unknown. The ſociety of adventurers had its riſe in Burgundy, and its firſt eſtabliſhment from John duke of Brabant, in 1248, being known by the name of *The brotherhood of St Thomas à Becket*. It was afterwards tranſlated into England, and ſucceſſively confirmed by Edward III. and IV. Richard III. Henry IV. V. VI. and VII. who gave it the appellation of *Merchant Adventurers*.

ADVERB, in grammar, a particle joined to a verb, adjective, or participle, to explain their manner of acting or ſuffering; or to mark ſome circumſtance or quality ſignified by them. The word is formed from the prepoſition *ad*, "to," and *verbum*, "a verb;" and ſignifies literally a word joined to a verb, to ſhow how, when, or where, one is, does, or ſuffers; as, the boy paints *neatly*, writes *ill:* the houſe ſtands *there*, &c. See Grammar.

ADVERSARIA, among the ancients, a book of accounts, not unlike our journals or day-books. It is more particularly uſed for a kind of common-place-book.—See Common-place-book.

ADVERSATIVE, in grammar, a word expreſſing ſome difference between what goes before and what follows it. Thus, in the phraſe, *he is an honeſt man, but a great enthuſiaſt*, the word *but* is an adverſative conjunction.

ADVERSATOR, in antiquity, a ſervant who attended the rich in returning from ſupper, to give them notice of any obſtacles in the way, at which they might be apt to ſtumble.

ADVERTISEMENT, in a general ſenſe, denotes any information given to perſons intereſted in an affair; and is more particularly uſed for a brief account of an affair inſerted in the public papers, for the information of all concerned.

ADULA (anc. geog.), a mountain in Rhætia, or the country of the Griſons, part of the Alps, in which are the fountains of the Rhine; now *St Godhards*.

ADULE, or Adulis, (anc. geog.) a town of Egypt, built by fugitive ſlaves, diſtant from its port on the Red Sea 20 ſtadia. Pliny calls the inhabitants *Adulitae*. The epithet is either *Adulitanus;* as, *Monumentum Adulitanum*, on the pompous inſcription of the ſtatue of Ptolemy Euergetes, publiſhed by Leo Alatius at Rome in 1631, and to be found in Spon and Thevenot: Or, *Adulicus;* as *Adulicus Sinus*, a part of the Red Sea.

ADULT, an appellation given to any thing that is arrived at maturity; Thus we ſay, an adult perſon, an adult plant, &c. Among civilians, it denotes a youth between 14 and 25 years of age.

ADULTERER, a man who commits adultery.—See Adultery.

ADULTERESS, a woman guilty of adultery. An adultereſs, by the Engliſh law, undergoes no temporal puniſhment whatever, except the loſs of her dower; and ſhe does not loſe even that, if her huſband is weak enough to be reconciled to her, and cohabit with her after the offence committed. 13 Ed. I. cap. 34.

But it is to be obſerved, that adultereſſes are ſuch either by the canon or civil law. According to the former, a woman is an adultereſs who, either being herſelf married, converſes carnally with another man; or being ſingle herſelf, converſes with a man that is married. According to the latter, ſhe is not an adultereſs, if ſhe be not herſelf in the married ſtate, though ſhe converſes with a man that is. The crime, in this caſe, was more properly called *ſtuprum* than *adulterium*. Hence, among the Romans, the word *adultera*, "adultereſs," differed from *pellex*, which denoted a ſingle woman who cohabited with a married man: and *pellex* differed from *concubina*, which ſignified her who had only intercourſe with an unmarried man. The former was reputed infamous, and the latter innocent.

ADULTERATION, the act of debaſing, by an improper mixture, ſomething that was pure and genuine.

The word is Latin, formed of the verb *adulterare*, "to corrupt," by mingling ſomething foreign to any ſubſtance. There are laws in England againſt the adulteration of coffee, tea, tobacco, ſnuff, wine, beer, bread, wax, hair-powder, &c.

Adulteration of Coin, properly imports the making, or caſting of a wrong metal, or with too baſe or too much alloy.

Adulterations of coins are effected divers ways; as, by forging another ſtamp or inſcription; by mixing impure metals with the gold or ſilver; moſt properly, by making uſe of a wrong metal, or an undue alloy, or too great an admixture of the baſer metals with gold or ſilver. Counterfeiting the ſtamp, or clipping and leſſening the weight, do not ſo properly come under the denomination of *adulterating*.—Evelyn gives rules and methods, both of adulterating and detecting adulterated metals, &c.—*Adulterating* is ſomewhat leſs extenſive than *debaſing*, which includes diminiſhing, clipping, &c.

To adulterate or debaſe the current coin, is a capital crime in all nations.—The ancients puniſhed it with great ſeverity: among the Egyptians both hands were cut off; and by the civil law, the offender was thrown to wild beaſts. The emperor Tacitus enacted, that counterfeiting the coin ſhould be capital; and under Conſtantine it was made treaſon, as it is alſo among us. The adulterating of gems is a curious art, and the methods of detecting it no leſs uſeful. Nicholas Lapid. p. 18.

ADULTERINE, in the civil law, is particularly applied to a child iſſued from an adulterous amour or commerce. Adulterine children are more odious than the illegitimate offspring of ſingle perſons.—The Roman law even refuſes them the title of natural children; as if nature diſowned them.—Adulterine children are not eaſily diſpenſed with for admiſſion to orders. Thoſe are not deemed adulterine, who are begotten of a woman openly married, through ignorance of a former wife being alive.—By a decree of the parliament of Paris, adulterine children are declared not legitimated by the ſubſequent marriage of the parties, even though a papal diſpenſation be had for ſuch marriage, wherein is a clauſe of legitimation.

Adulterine Marriages, in St Auguſtin's ſenſe, denote ſecond marriages, contracted after a divorce.

ADULTERY, an unlawful commerce between one married perſon and another, or between a married and unmarried perſon.

Puniſhments have been annexed to adultery in moſt ages and nations, though of different degrees of ſeverity. In many it has been capital; in others venial, and attended only with ſlight pecuniary mulcts. Some of the penalties are ſerious, and even cruel; others of a jocoſe and humorous kind. Even contrary things have been enacted as puniſhments for adultery. By ſome laws, the criminals are forbid marrying together, in caſe they became ſingle; by others, they are forbid to marry any beſides each other; by ſome, they are incapacitated from ever committing the like crime again; by others, they are glutted with it till it becomes downright nauſeous.

Among the rich Greeks, adulterers were allowed to redeem themſelves by a pecuniary fine; the woman's father, in ſuch caſes, returned the dower he had received from her huſband, which ſome think was refunded by the adulterer. Another puniſhment among thoſe people was, putting out the eyes of adulterers.

The Athenians had an extraordinary way of puniſhing adulterers, called παρατιλμος αραφανιδωσις, practiſed at leaſt on the poorer ſort who were not able to pay the fines. This was an awkward ſort of empalement, performed by thruſting one of the largeſt radiſhes up the anus of the adulterer, or, in defect thereof, a fiſh with a large head, called *mugil*, "mullet." Alcæus is ſaid to have died this way, though it is doubted whether the puniſhment was reputed mortal. Juvenal and Catullus ſpeak of this cuſtom, as received alſo among the Romans, though not authoriſed by an expreſs law, as it was among the Greeks.

There are various conjectures concerning the ancient puniſhment of adultery among the Romans. Some will have it to have been made capital by a law of Romulus, and again by the twelve tables. Others, that it was firſt made capital by Auguſtus; and others, not before the emperor Conſtantine. The truth is, the puniſhment in the early days was very various, much being left to the diſcretion of the huſband and parents of the adulterous wife, who exerciſed it differently, rather with the ſilence and countenance of the magiſtrate than any formal authority from him. Thus we are told, the wife's father was allowed to kill both parties, when caught in the fact, provided he did it immediately, killed both together, and as it were with one blow. The ſame power ordinarily was not indulged the huſband, except the crime were committed with ſome mean or infamous perſon; tho', in other caſes, if his rage carried him to put them to death, he was not puniſhed as a murderer. On many occaſions, however, revenge was not carried ſo far; but mutilating, caſtrating, cutting off the ears, noſes, &c. ſerved the turn. The puniſhment allotted by the *lex Julia*, was not, as many have imagined, death; but rather baniſhment, or deportation, being interdicted fire and water: though Octavius appears, in ſeveral inſtances, to have gone beyond his own law, and to have put adulterers to death. Under Macrinus, many were burnt at a ſtake. Conſtantine firſt by law made the crime capital. Under Conſtantius and Conſtans, adulterers were burnt, or ſewed in ſacks and thrown into the ſea. Under Leo and Marcian, the penalty was abated to perpetual baniſhment, or cutting off the noſe. Under Juſtinian, a further mitigation was granted, at leaſt in favour of the wife, who was only to be ſcourged, loſe her dower, and be ſhut up in a monaſtery: after two years, the huſband was at liberty to take her back again; if he refuſed, ſhe was ſhaven, and made a nun for life: But it ſtill remained death in the huſband. The reaſon alleged for this difference is, that the woman is the weaker veſſel. Matthæus declaims againſt the empreſs Theodora, who is ſuppoſed to have been the cauſe of this law, as well as of others procured in favour of that ſex from the emperor.

Under Theodoſius, women convicted of this crime were puniſhed after a very ſingular manner, viz. by a public conſtupration; being locked up in a narrow cell, and forced to admit to their embraces all the men that would offer themſelves. To this end, the gallants were to dreſs themſelves on purpoſe, having ſeveral little bells faſtened to their clothes, the tinkling of which gave notice to thoſe without of every motion. The cuſtom was again aboliſhed by the ſame prince.

By the Jewiſh law, adultery was puniſhed by death in both parties, where they were both married, or only the woman. The Jews had a particular method of trying, or rather purging, an adultereſs, or a woman ſuſpected of the crime, by making her drink the bitter waters of jealouſy; which, if ſhe were guilty, made her ſwell.

Among the Mingrelians, according to Chardin, adultery is puniſhed with the forfeiture of a hog, which is uſually eaten in good friendſhip between the gallant, the adultereſs, and the cuckold. In ſome parts of the Indies, it is ſaid any man's wife is permitted to proſtitute herſelf to him who will give an elephant for the uſe of her; and it is reputed no ſmall glory to her to have been rated ſo high. Adultery is ſaid to be ſo frequent at Ceylon, that not a woman but practiſes it, notwithſtanding its being puniſhable with death. Among the Japaneſe, and divers other nations, adultery is only penal in the woman. Among the Abyſſinians, the crime of the huſband is ſaid to be only puniſhed on the innocent wife. In the Marian iſlands, on the contrary, the woman is not puniſhable for adultery; but if the man go aſtray he pays ſeverely: the wife and her relations waſte his lands, turn him out of his houſe, &c. Among the Chineſe, there is reaſon to conclude that adultery is not capital; for it is ſaid that fond parents will make a contract for their daughters future huſbands to allow them the indulgence of a gallant.

In Spain, they puniſhed adultery in men by cutting off that part which had been the inſtrument of the crime. In Poland, before Chriſtianity was eſtabliſhed, they puniſhed adultery and fornication in a very particular manner: the criminal they carried to the market-place, and there faſtened him by the teſticles with a nail; laying a razor within his reach, and leaving him under the neceſſity, either of doing juſtice upon himſelf or of periſhing in that condition.

The Saxons formerly burnt the adultereſs, and over her aſhes erected a gibbet, whereon the adulterer was hanged. In England, likewiſe, adultery, by the ancient laws, was ſeverely puniſhed. King Edmund the Saxon ordered adultery to be puniſhed in the ſame manner as homicide; and Canute the Dane ordered that a man who committed adultery ſhould be baniſhed, and that the woman ſhould have her noſe and ears cut off. In the time of Henry I. it was puniſhed with the loſs of eyes and genitals.

In Britain, adultery is reckoned a ſpiritual offence, that is, cognizable by the ſpiritual courts, where it is puniſhed by fine and penance. The common law takes no farther notice of it, than to allow the party grieved an action and damages. This practice is often cenſured by foreigners, as making too light of a crime, the bad conſequences of which, public as well as private, are ſo great. It has been anſwered, that perhaps this penalty, by civil action, is more wiſely calculated to prevent the frequency of the offence, which ought to be the end of all laws, than a ſevere puniſhment. He that by a judgment of law is, according to circumſtances, ſtripped of great part of his fortune, thrown into priſon till he can pay it, or forced to fly his country, will, no doubt, in moſt caſes, own that he pays dearly for his amuſement.

As to the moral turpitude of this offence, ſome have vainly endeavoured to deny or explain it away by various arguments, and even by an appeal to ſcripture. On the part of the *man* who ſolicits the chaſtity of a married woman, it certainly includes the crime of SEDUCTION, and is attended with miſchief ſtill more complicated and extenſive: It creates a new ſufferer, the injured huſband, upon whoſe ſimplicity and affection is inflicted a wound the moſt painful and incurable that human nature knows. The infidelity of the *woman* is aggravated by cruelty to her children, who are generally involved in their parent's ſhame, and always made unhappy by their quarrel.

It has been argued, that theſe conſequences ought leſs to be attributed to the crime than to the diſcovery. But, in the firſt place, the crime could not be diſcovered unleſs it were committed, and the commiſſion is never ſecure from diſcovery. 2*dly*, If adulterous connections were allowable whenever the parties could hope to eſcape detection, which is the concluſion to which this argument leads, the huſband would be left no other ſecurity for his wife's chaſtity, than in her want of opportunity of temptation: which would probably deter moſt men from marrying; or render marriage a ſtate of continual jealouſy and alarm to the huſband, which would end in the ſlavery and confinement of the wife.

The marriage-vow is "witneſſed before God," and accompanied with circumſtances of ſolemnity and religion which approach to the nature of an oath. The married offender, therefore, incurs a crime little ſhort of perjury, and the ſeduction of a married woman is little leſs than ſubornation of perjury:—and this guilt is independent of the diſcovery.

But the uſual apology for adultery is the prior tranſgreſſion of the other party: and ſo far, indeed, as the bad effects of adultery are anticipated by the conduct of the huſband or wife who offends firſt, the guilt of the ſecond offender is extenuated. But this can never amount to a juſtification; unleſs it could be ſhown that the obligation of the marriage-vow depends upon the condition of reciprocal fidelity; a conſtruction which appears founded neither in expediency, nor in the terms of the vow, nor in the deſign of the legiſlature which preſcribed the marriage-rite. The way of conſidering the offence upon the footing of *provocation* and *retaliation*, is a childiſh trifling with words.

"Thou ſhalt not commit adultery," was an interdict delivered by God himſelf; yet ſcripture has been adduced as giving countenance to the crime. As Chriſt told the woman taken in adultery, "Neither do *I condemn* thee," we muſt believe, it is ſaid, that he deemed her conduct either not criminal, or at leaſt not a crime of the heinous nature we repreſent it to be. But from a more attentive examination of the caſe, it will be evident that nothing can be concluded from it favourable to ſuch an opinion. The tranſaction is thus related *: 'Early in the morning Jeſus came again into the temple, and all the people came unto him; and he ſat down and taught them: and the Scribes and Phariſees brought unto him a woman taken in adultery; and when they had ſet her in the midſt, they ſay unto him, Maſter, this woman was taken in adultery, in the very act; now Moſes in the law commanded that ſuch ſhould be ſtoned, but what ſayeſt thou? This they ſaid tempting him, that they might have to accuſe him: but Jeſus ſtooped down, and with his finger wrote on the ground, as though he heard them not. So when they continued aſking him, he lift up himſelf, and ſaid unto them, He that is without ſin amongſt you, let him firſt caſt a ſtone at her; and again he ſtooped down and wrote on the ground: and they which heard it, being convicted by their own conſcience, went out one by one, beginning at the eldeſt, even unto the laſt; and Jeſus was left alone, and the woman ſtanding in the midſt. When Jeſus had lift up himſelf, and ſaw none but the woman, he ſaid unto her, Woman, where are thoſe thine accuſers? Hath no man condemned thee? She ſaid unto him, No man, Lord: and he ſaid unto her, *Neither do I condemn thee*; go and ſin no more."

*St John's Gospel, ch. viii.

‘ This they ſaid tempting him, that they might ‘ have to accuſe him ;’ that is, to draw him into an exerciſe of judicial authority, that they might have to accuſe him before the Roman governor of uſurping or intermeddling with the civil government.

Paley's *Moral and Political Philoſophy*, Philad. ed. p. 203.

“ This was their deſign; and Chriſt's behaviour throughout the whole affair proceeded from a knowledge of this deſign, and a determination to defeat it. He gives them at firſt a cold and ſullen reception, well ſuited to the inſidious intention with which they came : ‘ he ſtooped down, and with his finger wrote on ‘ the ground as though he heard them not.’ ‘ When ‘ they *coutinued* aſking him,’ when they teazed him to ſpeak, he diſmiſſed them with a rebuke, which the impertinent malice of their errand, as well as the ſecret character of many of them, deſerved : ‘ he that is ‘ without ſin (that is, this ſin) among you, let him ‘ firſt caſt a ſtone at her.’ This had its effect. Stung with the reproof, and diſappointed of their aim, they ſtole away one by one, and left Jeſus and the woman alone. And then follows the converſation, which is the part of the narrative moſt material to our preſent ſubject. ‘ Jeſus ſaith unto her, Woman, where are ‘ thoſe thine accuſers ? Hath no man condemned thee ? ‘ She ſaid, No man, Lord. And Jeſus ſaid unto her, ‘ Neither do I condemn thee ; go and ſin no more.’ Now, when Chriſt aſked the woman, ‘ Hath no man ‘ *condemned* thee ?’ he certainly ſpoke, and was underſtood by the woman to ſpeak, of a legal and judicial condemnation ; otherwiſe her anſwer, ‘ No man, Lord,’ was not true. In every other ſenſe of condemnation, as blame, cenſure, reproof, private judgment, and the like, many had condemned her ; all thoſe, indeed, who brought her to Jeſus. If then a judicial ſentence was what Chriſt meant by *condemning* in the queſtion, the common uſe of language requires us to ſuppoſe that he meant the ſame in his reply, ‘ Neither do I con‘ demn thee :’ *i. e.* I pretend to no judicial character or authority over thee ; it is no office or buſineſs of mine to pronounce or execute the ſentence of the law. When Chriſt adds, ‘ Go and ſin no more,’ he in effect tells her that ſhe had ſinned already ; but as to the degree or quality of the ſin, or Chriſt's opinion concerning it, nothing is declared, or can be inferred, either way.”

It has been controverted, whether adultery may be lawfully committed in war, with the enemies wives ? The anſwer is in the negative, and the authoriſed practice of civilized nations is agreeable to this. It has alſo been a famous queſtion, whether it be lawful for a woman to commit adultery with the conſent of her huſband, and for the procuring ſome great good to him ? St Auſtin apparently allows of it ; at leaſt, does not condemn it*.

It has likewiſe been a diſpute, whether it be lawful for one of the parties married to commit adultry, with the conſent of the other, for the ſake of having children ? Of which we have inſtances in Abraham, who, on this account, converſed with Hagar ; and likewiſe among the Greeks and Romans. Pollman, a German profeſſor, has a diſſertation on the huſband's right to alienate his wife's body to another's uſe.

It is much diſputed, whether adultery diſſolves the bond of matrimony, and be a ſufficient cauſe of divorce, ſo that the parties may marry again. This was allowed in the ancient church, and is ſtill continued in the Greek, as well as in the Lutheran and Calviniſt churches. Romaniſts, however, diſallow of it, and the council of Trent even anathematized thoſe who maintain it ; though the canon of anathematization was mitigated in deference to the republic of Venice, in ſome of whoſe dominions, as Zant, Cephalonia, &c. the contrary uſage obtains. The eccleſiaſtical courts in England ſo far agree with thoſe of Rome, that they only grant a divorce *à menſa et thoro*, in caſe of adultery ; ſo that a complete divorce, to enable the parties to marry again, cannot be had without an act of parliament.

Adultery is alſo uſed in ancient cuſtoms, for the puniſhment or fine impoſed for that offence, or the privilege of proſecuting for it. In which ſenſe, *adulterium* amounts to the ſame with what the Saxons call *legerwita*.

Adultery is ſometimes uſed, in a more extenſive ſenſe, for any ſpecies of impurity or crime, againſt the virtue of chaſtity ; and in this ſenſe divines underſtand the ſeventh commandment.

Adultery is alſo uſed, eſpecially in ſcripture, for idolatry, or departing from the true God, to the worſhip of a falſe one.

Adultery is alſo uſed, in eccleſiaſtical writers, for a perſon's invading or intruding into a biſhopric during the former biſhop's life. The reaſon of the appellation is, that a biſhop is ſuppoſed to contract a kind of ſpiritual marriage with his church. The tranſlation of a biſhop from one ſee to another was alſo reputed a ſpecies of adultery ; on the ſuppoſition of its being a kind of ſecond marriage, which, in thoſe days, was eſteemed a degree of adultery. This concluſion was founded on that text of St Paul, *Let a biſhop be the huſband of one wife*, by a forced conſtruction of church for wife and of biſhop for huſband. Du-Cange.

Adultery is alſo uſed, in ancient naturaliſts, for the act of ingrafting one plant upon another. In which ſenſe, Pliny ſpeaks of the adulteries of trees, *arborum adulteria*, which he repreſents as contrary to nature, and a piece of luxury, or needleſs refinement.

ADVOCATE, among the Romans, a perſon ſkilled in their law, who undertook the defence of cauſes at the bar. The Roman advocates anſwered to one part of the office of a barriſter in England, viz. the pleading part ; for they never gave counſel, that being the buſineſs of the *juriſconſulti*.

The Romans, in the firſt ages of their ſtate, held the profeſſion of an advocate in great honour ; and the ſeats of the bar were crowded with ſenators and conſuls ; they, whoſe voices commanded the people, thinking it an honour to be employed in defending them. They were ſtyled *comites, honorati, clariſſimi*, and even *patroni* ; as if their clients were not leſs obliged to them than freedmen to their maſters. The bar was not at that time venal. Thoſe who aſpired to honours and offices took this way of gaining an intereſt in the people, and always pleaded *gratis*. But no ſooner were luxury and corruption introduced into the commonwealth, than the bar became a ſharer in them. Then it was that the ſenators let out their voices for pay, and zeal and eloquence were ſold to the higheſt bidder. To put a ſtop to this abuſe, the

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* *De Serm. Dom. in Mont.* lib. i cap. 16. § 59. *et De Civ. Dei*, lib. xvi. cap. 25.

Advocates. tribune Cincius procured a law to be paſſed, called from him *Lex Cincia*, whereby the advocates were forbid to take any money of their clients. It had before this been prohibited the advocates to take any preſents or gratuities for their pleading. The emperor Auguſtus added a penalty to it: notwithſtanding which, the advocates played their parts ſo well, that the emperor Claudius thought it an extraordinary circumſtance, when he obliged them not to take above eight great ſeſterces, which are equivalent to about 64l. Sterling, for pleading each cauſe.

Advocate is ſtill uſed, in countries and courts where the civil law obtains, for thoſe who plead and defend the cauſes of clients entruſted to them.

Advocate of a City, in the German polity, a magiſtrate appointed in the emperor's name to adminiſter juſtice.

Advocate is more particularly uſed, in church hiſtory, for a perſon appointed to defend the rights and revenues of a church or religious houſe. The word *advocatus*, or *advowee*, is ſtill retained for what we uſually call the *patron*, or he who has the advowſon, or right of preſentation, in his own name.

Conſiſtorial Advocates; officers of the conſiſtory at Rome, who plead in all oppoſitions to the diſpoſal of benefices in that court: they are ten in number.

Elective Advocates, thoſe choſen by the abbot, biſhop, or chapter; a particular licence being had from the king, or prince, for that purpoſe. The elections were originally made in the preſence of the count of the province.

Feudal Advocates. Theſe were of the military kind, who, to make them more zealous for the intereſt of the church, had lands granted them in fee, which they held of the church, and did homage, and took an oath of fidelity to the biſhop or abbot. Theſe were to lead the vaſſals of the church to war, not only in private quarrels of the church itſelf, but in military expeditions for the king's ſervice, in which they were the ſtandard-bearers of their churches.

Fiſcal Advocate, *fiſci advocatus*, in Roman antiquity, an officer of ſtate under the Roman emperors, who pleaded in all cauſes wherein the *fiſcus*, or private treaſury, was concerned.

Juridical Advocates, in the middle age, were thoſe who from attending cauſes in the court of the comes, or count of the province, became judges themſelves, and held courts of their vaſſals thrice a-year, under the name of the *tria placita generalia*. In conſideration of this further ſervice, they had a particular allowance of one third part of all fines, or mulcts, impoſed on defaulters, &c. beſides a proportion of diet for themſelves and ſervants.

Matricular Advocates, were the advocates of the mother or cathedral churches.

Military Advocates, thoſe appointed for the defence of the church, rather by arms and authority than by pleading and eloquence. Theſe were introduced in the times of confuſion, when every perſon was obliged to maintain their own property by force; biſhops and abbots not being permitted to bear arms, and the ſcholaſtic or gowned advocates being equally unacquainted with them, recourſe was had to knights, noblemen, ſoldiers, or even to princes.

Nominative Advocates, thoſe appointed by king or pope. Sometimes the churches petitioned kings, &c. to appoint them an advocate; at other times this was done of their own accord. By ſome regulations, no perſon was capable of being elected advocate, unleſs he had an eſtate in land in the ſame county. Advocates

Regular Advocates, thoſe duly formed and qualified for their profeſſion, by a proper courſe of ſtudy, the requiſite oath, ſubſcription, licence, &c.

Subordinate Advocates, thoſe appointed by other ſuperior ones, acting under them, and accountable to them. There were various reaſons for the creation of theſe ſubordinate advocates; as, the ſuperior quality of the principal advocate, his being detained in war, or being involved in other affairs; but chiefly the too great diſtance of ſome of the church-lands, and their lying in the dominions of foreign princes.

Supreme or *Sovereign Advocates*, were thoſe who had the authority in chief; but acted by deputies or ſubordinate advocates. Theſe were called alſo *principal, greater*, and ſometimes *general* advocates. Such in many caſes were kings, &c. when either they had been choſen advocates, or became ſuch by being founders or endowers of churches. Princes had alſo another title to advocateſhip, ſome of them pretending to be *advocati nati* of the churches within their dominions.

Advocates, in the Engliſh courts, are more generally called *counſel*. See Counsel.

Faculty of Advocates, in Scotland, a reſpectable body of lawyers, who plead in all cauſes before the Courts of Seſſion, Juſticiary, and Exchequer. They are alſo intitled to plead in the houſe of peers, and other ſupreme courts in England.

In the year 1660, the faculty founded a library upon a very extenſive plan, ſuggeſted by that learned and eminent lawyer Sir George M'Kenzie of Roſehaugh, advocate to king Charles II. and king James VII. who enriched it with many valuable books. It has been daily increaſing ſince that time, and now contains not only the beſt collection of law-books in Europe, but a very large and ſelect collection of books on all ſubjects. Beſides, this library contains a great number of original manuſcripts, and a vaſt variety of Jewiſh, Grecian, Roman, Scots, and Engliſh coins and medals.

A candidate for the office of an advocate undergoes three ſeveral trials: The firſt is in Latin, upon the civil law and Greek and Roman antiquities; the ſecond, in Engliſh, upon the municipal law of Scotland; and, in the third he is obliged to defend a Latin theſis, which is impugned by three members of the faculty. Immediately before putting on the gown, the candidate makes a ſhort Latin ſpeech to the lords, and then takes the oaths to the government and *de fideli*.

The faculty at preſent conſiſts of above 200 members. As an advocate or lawyer is eſteemed the genteeleſt profeſſion in Scotland, many gentlemen of fortune take the degree of advocate, without having any intention of practiſing at the bar. This circumſtance greatly increaſes their number, gives dignity to the profeſſion, and enriches their library and public fund. It is from this reſpectable body that all vacancies on the bench are generally ſupplied.

Lord Advocate, or *King's Advocate*, one of the eight great officers of ſtate in Scotland, who as ſuch ſat in parliament without election. He is the principal crown-lawyer in Scotland. His buſineſs is to act as a public proſecutor, and to plead in all cauſes that concern the crown; but particularly in ſuch as are of a criminal nature. The office of king's advocate is not very ancient: it ſeems to have been eſtabliſhed about the beginning of the 16th century. Originally he had no power to proſecute crimes without the concurrence of a private party: but, in the year 1597, he was empowered to proſecute crimes at his own inſtance. He has the privilege of pleading in court with his hat on. This privilege was firſt granted to Sir Thomas Hope; who having three ſons lords of ſeſſion, it was thought indecent that the father ſhould plead uncovered before the ſons, who as judges ſat covered.

Bill of ADVOCATION, in Scots law, a writing drawn up in the form of a petition; whereby a party, in an action before an inferior court, applies to the ſupreme court, or court of Seſſion, for calling the action from the inferior court before itſelf.

Letters of Advocation, in Scots law, the decree or warrant of the court of Seſſion upon cogniſance of the facts ſet forth in the bill, drawn up in the form of a ſummons, and paſſing under the ſignet, diſcharging the inferior judge and all others from further procedure in the cauſe, and advocating it to itſelf.

ADVOWEE, in ancient cuſtoms and law books, denotes the advocate of a church, religious houſe, or the like. There were advowees of cathedrals, abbeys, monaſteries, &c. Thus, Charlemagne had the title of advowee of St Peter's; king Hugh, of St Riquier; and Bolandus mentions ſome letters of pope Nicholas, by which he conſtituted king Edward the Confeſſor, and his ſucceſſors, advowees of the monaſtery at Weſtminſter, and of all the churches in England. Theſe advowees were the guardians, protectors, and adminiſtrators of the temporal concerns of the churches, &c. and under their authority were paſſed all contracts which related to them. It appears alſo, from the moſt ancient charters, that the donations made to churches were conferred on the perſons of the advowees. They always pleaded the cauſes of the churches in court, and diſtributed juſtice for them, in the places under their juriſdiction. They alſo commanded the forces furniſhed by their monaſteries, &c. for the war: and even were their champions, and ſometimes maintained duels for them.

This office is ſaid to have been firſt introduced in the fourth century, in the time of Stillico; though the Benedictines do not fix its origin before the eighth century. By degrees, men of the firſt rank were brought into it, as it was found neceſſary either to defend with arms or to protect with power and authority. In ſome monaſteries they were only called *conſervators*; but theſe, without the name, had all the functions of advowees. There were alſo ſometimes ſeveral ſub-advowees, or ſub-advocates, in each monaſtery, who officiated inſtead of the advowees themſelves; which, however, proved the ruin of monaſteries; thoſe inferior officers running into great abuſes.

Hence alſo, huſbands, tutors, and every perſon in general, who took upon him the defence of another, were denominated *advowees*, or advocates. Hence ſeveral cities had their advowees; which were eſtabliſhed long after the eccleſiaſtical ones, and doubtleſs from their example. Thus we read in hiſtory of the advowees of Augſburg, of Arras, &c.

The *vidames* aſſumed the quality of advowees; and hence it is, that ſeveral hiſtorians of the eighth century confound the two functions together. Hence alſo it is, that ſeveral ſecular lords in Germany bear mitres for their creſts, as having anciently been advowees of the great churches.

Spelman diſtinguiſhes two kinds of eccleſiaſtical advowees.—The one, of cauſes or proceſſes, *advocati cauſarum*; the other, of territory or lands, *advocati ſoli*. The former were nominated by the king, and were uſually lawyers, who undertook to plead the cauſes of the monaſteries. The other, which ſtill ſubſiſt, and are ſometimes called by their primitive name, *advowees*, though more uſually *patrons*, were hereditary; as being the founders and endowers of churches, &c. or their heirs.

Women were ſometimes advowees, *advocatiſſæ*. And, in effect, the canon law mentions ſome who had this title, and who had the ſame right of preſentation, &c. in their churches which the advowees themſelves had. In a ſtat. 25 Edw. III. we meet with *advowee paramount* for the higheſt patron; that is, the king.

ADVOWSON, or Advowzen, in common law, ſignifies a right to preſent to a vacant benefice. Advowſon is ſo called, becauſe the right of preſenting to the church was firſt gained by ſuch as were founders, benefactors, or maintainers of the church.

Though the nomination of fit perſons to officiate in every dioceſe was originally in the biſhop, yet they were content to let the founders of churches have the nomination of the perſons to the churches ſo founded, reſerving to themſelves a right to judge of the fitneſs of the perſons ſo nominated.

Advowſons formerly were moſt of them appendant to manors, and the patrons were parochial barons: the lordſhip of the manor and patronage of the church were ſeldom in different hands, until advowſons were given to religious houſes. But of late times the lordſhip of the manor and advowſon of the church have been divided.

Advowſons are *preſentative*, *collative*, or *donative*: *preſentative*, where the patron preſents or offers his clerk to the biſhop of the dioceſe, to be inſtituted in his church; *collative*, where the benefice is given by the biſhop, as original patron thereof, or by means of a right he has acquired by lapſe; *donative*, as where the king or other patron does, by a ſingle donation in writing, put the clerk into poſſeſſion, without preſentation, inſtitution, or induction.

Sometimes, anciently, the patron had the ſole nomination of the prelate, abbot, or prior; either by inveſtiture (*i. e.* delivery of a paſtoral ſtaff), or by direct preſentation to the dioceſan; and if a free election was left to the religious, yet a *conge d'elire*, or a licence of election, was firſt to be obtained of the patron, and the perſon elected was confirmed by him. If the founder's family became extinct, the patronage of the convent went to the lord of the manor. Unleſs the ſeveral colleges in the univerſities be reſtrained in the number of advowſons they may receive, it is argued they will in time acquire ſuch a ſtock as to fruſtrate the deſign of their foundation (which is the education of youth, by creating too quick a ſucceſſion of fellows; ſo that there will not be in the colleges a ſufficient number of perſons of competent age, knowledge, and experience, to inſtruct and form the minds of the youth.—In ſome colleges the number of advowſons is ſaid to be already two thirds, or more, of the number of fellows. It is objected, on the other ſide, that the ſucceſſion of fellows may be too ſlow as well as too quick; whereby perſons well qualified may be detained ſo long in colleges as not to have ſtrength or activity enough left for the diſcharge of parochial functions.

Colleges holding more advowſons in number than a moiety of the fellows, are not capable of purchaſing more. Grants of advowſons by papiſts are void. 9 Geo. II. c. 36. § 5. 11 Geo. II. c. 17. § 5.

Advowſons are temporal inheritances and lay fees; they may be granted by deed or will, and are aſſets in the hands of heirs or executors. Preſentations to advowſons for money, or other reward, are void. 31 Eliz. cap. 6.

In Scotland, this right is called *patronage*. See PATRONAGE.

ADUST, ADUSTUS, among phyſicians, &c. is applied to ſuch humours as by long heat become of a hot and fiery nature. Such is choler ſuppoſed to be. Melancholy is uſually conſidered as black and aduſt bile. Blood is ſaid to be aduſt, when, by reaſon of ſome extraordinary heat, its more ſubtile parts are all evaporated, leaving the groſſer, with all the impurities therein, half torrified.

ADY, in natural hiſtory, a name given to the palm-tree of the iſland of St Thomas. It is a tall tree, with a thick, bare, upright ſtem, growing ſingle on its root, of a thin light timber, and full of juice. The head of this tree ſhoots into a vaſt number of branches, which being cut off, or an inciſion being made therein, afford a great quantity of ſweet juice, which fermenting ſupplies the place of wine among the Indians. The fruit of this tree is called by the Portugueſe *Caryoces* and *Carioſſe*; and by the black natives, *Abanga*. This fruit is of the ſize and ſhape of a lemon; and contains a kernel, which is good to eat. The fruit itſelf is eat roaſted, and the raw kernels are often mixed with mandioc meal. Theſe kernels are ſuppoſed very cordial. An oil is alſo prepared from this fruit, which anſwers the purpoſe of oil or butter. This oil is alſo uſed for anointing ſtiff and contracted parts of the body.

ADYNAMIA, in medicine, debility, or weakneſs, from ſickneſs.

ADYNAMON, among ancient phyſicians, a kind of weak factitious wine, prepared from muſt boiled down with water; to be given to patients to whom genuine wine might be hurtful.

ADYTUM, in pagan antiquity, the moſt retired and ſacred place of their temples, into which none but the prieſts were allowed to enter. The *Sanctum Sanctorum* of the temple of Solomon was of the nature of the pagan adytum, none but the high prieſt being admitted into it, and he but once a-year.

ADZE, or ADDICE, a cutting tool of the ax kind; having its blade made thin and arching, and its edge at right angles to the handle; chiefly uſed for taking off thin chips of timber or boards, and for paring away certain irregularities which the ax cannot come at. The adze is uſed by carpenters, but more by coopers, as being convenient for cutting the hollow ſides of boards, &c. It is ground from a baſe on its inſide to its outer edge; ſo that, when it is blunt, they cannot conveniently grind it without taking its helve out of the eye.

AE, or Æ, a diphthong compounded of A and E. Authors are by no means agreed as to the uſe of the *ae* in Engliſh words.—Some, out of regard to etymology, inſiſt on its being retained in all words, particularly technical ones, borrowed from the Greek and Latin; while others, from a conſideration that it is no proper diphthong in our language, its ſound being no other than that of the ſimple *e*, contend that it ought to be entirely diſuſed; and, in fact, the ſimple *e* has of late been adopted inſtead of the Roman *æ*, as in the word *equator*, &c.

ÆACEA, in Grecian antiquity, ſolemn feſtivals and games celebrated at Ægina, in honour of Æacus.

ÆACUS, the ſon of Jupiter by Ægina. When the iſle of Ægina was depopulated by a plague, his father, in compaſſion to his grief, changed all the ants upon it into men and women, who were called *Myrmidons*, from μυρμηξ, *an ant*. The foundation of the fable is ſaid to be, that when the country had been depopulated by pirates, who forced the few that remained to take ſhelter in caves, Æacus encouraged them to come out, and by commerce and induſtry, recover what they had loſt. His character for juſtice was ſuch, that, in a time of univerſal drought, he was nominated by the Delphic oracle to intercede for Greece, and his prayer was anſwered. See the article ÆGINA. The Pagans alſo imagined that Æacus, on account of his impartial juſtice, was choſen by Pluto one of the three judges of the dead: and that it was his province to judge the Europeans.

ÆBURA (anc. geog), a town of Spain, in Eſtremadura, on the river Guadiana, to the weſt of Merida, now called *Talavera*. W. Long. 7. 15. Lat. 38. 40.

ÆCHMALOTARCHA, in Jewiſh antiquity, a title given to the principal leader or governor of the Hebrew captives reſiding in Chaldea, Aſſyria, and the neighbouring countries. This magiſtrate was called by the Jews *roſch-galath*, *i. e.* the chief of the captivity: but the above term, of like import in the Greek, is that uſed by Origen and others who wrote in the Greek tongue.

The Jewiſh writers aſſure us, that the *æchmalotarchæ* were only to be choſen out of the tribe of Judah. The eaſtern Jews had their princes of the captivity, as the weſtern Jews their patriarchs. The Jews are ſtill ſaid to have an *æchmalotarcha* at Babylon, but without the authority of the ancient ones. Baſnage Hiſt. Jews, and Prideaux's Connection.

ÆCULANUM (anc. geog.), a town of the Hirpini in Italy, at the foot of the Appenine, to the eaſt of Abellinum, contracted *Æclanum*, ſituate between Beneventum and Tarentum. The inhabitants are called *Æculani* by Pliny; and *Æclanenſes*, in an ancient inſcription, (Gruter). The town is now called *Fricento*, Cluverius, 43 miles eaſt of Naples. E. Long. 15. 38. Lat. 41. 15.

ÆDES, in Roman antiquity, beſides its more ordinary ſignification of a houſe, likewiſe ſignified an inferior kind of temple, conſecrated to ſome deity.

ÆDICULA, a term uſed to denote the inner part of the temple, where the altar and ſtatue of the deity ſtood.

ÆDILATE, the office of ædile, ſometimes called *Ædility*. See the next article.

ÆDILE (*ædilis*), in Roman antiquity, a magiſtrate whoſe chief buſineſs was to ſuperintend buildings of all kinds, but more eſpecially public ones, as temples, aquæducts, bridges, &c. To the ædiles likewiſe belonged the care of the highways, public places, weights and meaſures, &c. They alſo fixed the prices of proviſions, took cognizance of debauches, puniſhed lewd women, and ſuch perſons as frequented gaming houſes. The cuſtody of the plebiſcita, or orders of the people, was likewiſe committed to them. They had the inſpection of comedies and other pieces of wit; and were obliged to exhibit magnificent games to the people, at their own expence, whereby many of them were ruined. To them alſo belonged the cuſtody of the plebiſcita, and the cenſure and examination of books. They had the power, on certain occaſions, of iſſuing edicts; and, by degrees, they procured to themſelves a conſiderable juriſdiction, the cognizance of various cauſes, &c. This office ruined numbers by its expenſiveneſs; ſo that, in Auguſtus's time, even many ſenators declined it on that account.

All theſe functions which rendered the ædiles ſo conſiderable belonged at firſt to the ædiles of the people, *ædiles plebeii*, or *minores*: theſe were only two in number, and were firſt created in the ſame year as the tribunes: for the tribunes, finding themſelves oppreſſed with the multiplicity of affairs, demanded of the ſenate to have officers, with whom they might intruſt matters of leſs importance; and accordingly two ædiles were created; and hence it was that the ædiles were elected every year at the ſame aſſembly as the tribunes. But theſe plebeian ædiles having refuſed, on a ſignal occaſion, to treat the people with ſhows, as pleading themſelves unable to ſupport the expence thereof, the patricians made an offer to do it, provided they would admit them to the honor of the *ædilate*. On this occaſion there were two new ædiles created, of the number of the patricians, in the year of Rome 388; they were called *ædiles curules*, or *majores*; as having a right to ſit on a curule chair, enriched with ivory, when they gave audience; whereas the plebeian ædiles only ſat on benches.—Beſides that the curule ædiles ſhared all the ordinary functions with the plebeian, their chief employ was, to procure the celebration of the grand Roman games, and to exhibit comedies, ſhews of gladiators, &c. to the people; and they were alſo appointed judges in all caſes relating to the ſelling or exchanging eſtates.

To eaſe theſe four firſt ædiles, Cæſar created a new kind, called *ædiles cereales*, as being deputed chiefly to take care of the corn, which was called *donum cereris*; for the Heathens honoured Ceres as the goddeſs who preſided over corn, and attributed to her the invention of agriculture. Theſe ædiles cereales were alſo taken out of the order of patricians. In the municipal cities there were ædiles, and with the ſame authority as at Rome.

We alſo read of an *ædiles alimantarius*, expreſſed in abbreviature by *Ædil. alim.* whoſe buſineſs ſeems to have been to provide diet for thoſe who were maintained at the public charge, though others aſſign him a different office.—In an ancient inſcription we alſo meet with *ædile* of the camp, *ædilis caſtrorum*.

ÆDILITIUM EDICTUM, among the Romans, was that whereby a remedy was given a buyer, in caſe a vicious or unſound beaſt, or ſlave, was ſold him. It was called *ædilitium*, becauſe the preventing of frauds in ſales and contracts belonged eſpecially to the curule ædiles.

ÆDITUUS, in Roman antiquity, an officer belonging to the temple, who had the charge of the offerings, treaſure, and ſacred utenſils. The female deities had a woman officer of this kind called *Æditua*.

ÆGAGROPILA, a ball compoſed of a ſubſtance reſembling hair, generated in the ſtomach of the chamois-goat. This ball is of the ſame nature with thoſe found in cows, hogs, &c.

ÆGÆ, or ÆGÆA, (anc. geog.), the name of *Ædeſſa*, ſo called from the following adventure: Caranus, the firſt king of Macedonia, being ordered by the oracle to ſeek out a ſettlement in Macedonia, under the conduct of a flock of goats, ſurpriſed the town of Ædeſſa, during a thick fog and rainy weather, in following the goats that fled from the rain; which goats ever after, in all his military expeditions, he cauſed to precede his ſtandard; and in memory of this he called Ædeſſa *Ægæa*, and his people *Ægæadæ*. And hence probably, in the prophet Daniel, the he-goat is the ſymbol of the king of Macedon.

ÆGEAN SEA (anc. geog.) now the *Archipelago*, a part of the Mediterranean, ſeparating Europe from Aſia and Africa; waſhing, on the one hand, Greece and Macedonia; on the other, Caria and Ionia. The origin of the name is greatly diſputed. Feſtus advances three opinions: one, that it is ſo called from the many iſlands therein, at a diſtance appearing like ſo many goats: another, becauſe Ægea queen of the Amazons periſhed in it: a third opinion is, becauſe Ægeus, the father of Theſeus, threw himſelf headlong into it.

ÆGEUS, in fabulous hiſtory, was king of Athens, and the father of Theſeus. The Athenians having baſely killed the ſon of Minos king of Crete, for carrying away the prize from them, Minos made war upon the Athenians; and being victorious, impoſed this ſevere condition on Ægeus, that he ſhould annually ſend into Crete ſeven of the nobleſt of the Athenian youths, choſen by lot, to be devoured by the Minotaur. On the fourth year of this tribute, the choice fell on Theſeus; or, as others ſay, he himſelf intreated to be ſent. The king, at his ſon's departure, gave orders, that as the ſhip ſailed with black ſails, it ſhould return with the ſame in caſe he periſhed; but, if he became victorious, he ſhould change them into white. When Theſeus returned to Crete, after killing the Minotaur, and forgot to change the ſails in token of his victory, according to the agreement with his father; the latter, who watched the return of the veſſel, ſuppoſing by the black ſails that his ſon was dead, caſt himſelf headlong into the ſea, which afterwards obtained the name of the *Ægean Sea*. The Athenians decreed Ægeus divine honours; and ſacrificed to him as a marine deity, the adopted ſon of Neptune.

ÆGIAS, among phyſicians, a white ſpeck on the pupil of the eye, which occaſions a dimneſs of ſight.

ÆGIDA, (Pliny); now *Capo d'Iſtria*, the princi-

Ægilops
||
Ægina.

pal town on the north of the territory of Iſtria, ſituated in a little iſland, joined to the land by a bridge. In an inſcription, (Gruter), it is called *Ægidis Inſula.* E. Long. 14. 20. Lat. 45. 50. It was afterwards called *Juſtinopolis,* after the emperor Juſtinus.

ÆGILOPS, the name of a tumor in the great angle of the eye; either with, or without, an inflammation. The word is compounded of *αιξ, goat,* and *ωψ, eye;* as goats are ſuppoſed extremely liable to this diſtemper.

Authors frequently uſe the words *ægilops, anchilops,* and *fiſtula lachrymalis,* promiſcuouſly; but the more accurate, after Ægineta, make a difference.—The tumor, before it becomes ulcerous, is properly called *anchilops;* and, after it has got into the lachrymal paſſages, and has rendered the os lachrymale carious, *fiſtula lachrymalis.*

If the ægilops be accompanied with an inflammation, it is ſuppoſed to take its riſe from the abundance of blood which a plethoric habit diſcharges on the corner of the eye. If it be without an inflammation, it is ſuppoſed to proceed from a viſcous pituitous humour, thrown upon this part.

The method of cure is the ſame as that of the ophthalmia. But before it has reached the lachrymal paſſages, it is managed like other ulcers. If the ægilops be neglected, it burſts, and degenerates into a fiſtula, which eats into the bone.

ÆGILOPS, *Wild Feſtuc;* a genus of the monœcia order, belonging to the polygamia claſs of plants, and ranking under the 4th natural order, *Gramina.*—The characters are: The *hermaphrodite calyx* is a two-valved glume, triflorous; the corolla a two-valved glume, the exterior valvalet terminated by three ariſtæ or awns, the interior awnleſs: *Stamina,* three capillary filaments; ſtyle, two: *Seed,* one, oblong *Male calyx* and *corolla,* each a glume as in the former; the *ſtamina* the ſame number.—There are ſeven ſpecies, natives of Italy and ſome other parts of Europe; one of them, the incurvata, a native of Britain, grows by the ſea-ſhore, and is vulgarly called *ſea-hard-graſs.*

ÆGILOPS is alſo the trivial name of a ſpecies of QUERCUS.

ÆGIMURUS (anc. geog.), an iſland on the bay of Carthage, about 30 miles diſtant from that city, (Livy); now the *Galetta:* This iſland being afterwards ſunk in the ſea, two of its rocks remained above water, which were called *Aræ,* and mentioned by Virgil, becauſe the Romans and Carthaginians entered into an agreement or league to ſettle their mutual boundaries at theſe rocks.

ÆGINA, in fabulous hiſtory, the daughter of Æſopus, king of Bæotia, was beloved by Jupiter, who debauched her in the ſimilitude of a lambent flame, and then carried her from Epidaurus to a deſert iſland called *Oenope,* which afterwards obtained her own name.

ÆGINA (anc. geog.), an iſland on the Saronic Bay, or Bay of Engia, 20 miles diſtant from the Piræeus, formerly vying with Athens for naval power, and at the ſea-fight of Salamin diſputing the palm of victory with the Athenians. It was the country and kingdom of Æacus, who called it *Ægina* from his mother's name, it being before called *Oenopia,* (Ovid). The inhabitants were called *Æginetæ,* and *Æginenſes.* The Greeks had a common temple dedicated to Jupiter in Ægina. The Æginetæ applied to commerce; and were the firſt who coined money, called Νομισμα Αγιναιον: hence *Ægineticum æs,* formerly in great repute. The inhabitants were called *Myrmydones,* or a nation of ants, from their great application to agriculture. See ÆACUS.

Ægina.

This iſland was ſurrounded by Attica, the territory of Megara, and the Peloponneſus, each diſtant about 100 ſtadia, or 12 miles and a half. In circumference it was reckoned 180 ſtadia, or 22 miles and a half. It was waſhed on the eaſt and ſouth by the Myrtoan and Cretan ſeas.

It is now called *Eyina,* or *Egina,* the *g* ſoft and the *i* ſhort. The temple above-mentioned is ſituated upon the ſummit of a mountain called *Panhellenius,* about an hour diſtant from the ſhore. The Æginetans affirmed it was erected by ÆACUS; in whoſe time Hellas being terribly oppreſſed by drought, the Delphic oracle was conſulted; and the reſponſe was, That Jupiter muſt be rendered propitious by Æacus. The cities intreated him to be their mediator: He ſacrificed and prayed to Jupiter Panhellenius, and procured rain.

The temple was of the Doric order, and had ſix columns in front. Twenty-one of the exterior columns are yet ſtanding, with two in the front of the pronaos and of the poſticum, and five of the number which formed the ranges of the cell. The entablature, except the architrave, is fallen. The ſtone is of a light browniſh colour, much eaten in many places, and indicating a very great age. Some of the columns have been injured by boring to their centres for the metal. In ſeveral, the junction of the parts is ſo exact, that each ſeems to conſiſt of one piece. This ruin Mr Chandler conſiders as ſcarcely to be paralleled in its claim to a remote antiquity. The ſituation on a lonely mountain, at a diſtance from the ſea, has preſerved it from total demolition, amid all the changes and accidents of numerous centuries.

Near the ſhore is a barrow, raiſed, it is related, for Phocus, upon the following occaſion. Telamon and Peleus, ſons of Æacus, challenged their half-brother Phocus to contend in the Pentathlum. In throwing the ſtone, which ſerved as a quoit, Peleus hit Phocus, who was killed; when both of them fled. Afterwards, Telamon ſent a herald to aſſert his innocence. Æacus would not ſuffer him to land, or to apologize, except from the veſſel; or, if he choſe rather, from a heap caſt up in the water. Telamon, entering the private port by night, raiſed a barrow, as a token, it is likely, of a pious regard for the deceaſed. He was afterwards condemned, as not free from guilt; and ſailed away again to Salamis. The barrow in the ſecond century, when ſeen by Pauſanias, was ſurrounded with a fence, and had on it a rough ſtone. The terror of ſome dreadful judgment to be inflicted from heaven had preſerved it entire and unaltered to his time; and in a country depopulated and neglected, it may ſtill endure for many ages.

The ſoil of this iſland is, as deſcribed by Strabo, very ſtony, eſpecially the bottoms, but in ſome places not unfertile in grain. Beſides corn, it produces olives, grapes, and almonds; and abounds in pigeons and partridges. It has been related, that the Æginetans annually wage war with the feathered race, carefully

fully collecting or breaking their eggs, to prevent their multiplying, and in conſequence a yearly famine. They have no hares, foxes, or wolves. The rivers in ſummer are all dry. The vaiwode or governor farms the revenue of the Grand Signior for 12 purſes, or 6000 piaſtres. About half this ſum is repaid yearly by the caratch-money, or poll-tax.

Ægina, the capital of the above iſland. Its ſite has been long forſaken. Inſtead of the temples mentioned by Pauſanias, there are thirteen lonely churches, all very mean; and two Doric columns ſupporting their architrave. Theſe ſtand by the ſea-ſide toward the low cape; and, it has been ſuppoſed, are a remnant of a temple of Venus, which was ſituated by the port principally frequented. The theatre, which is recorded as worth ſeeing, reſembled that of the Epidaurians both in ſize and workmanſhip. It was not far from the private port; the ſtadium, which, like that at Priene, was conſtructed with only one ſide, being joined to it behind, and each ſtructure mutually ſuſtaining and propping the other. The walls belonging to the ports and arſenal were of excellent maſonry, and may be traced to a conſiderable extent, above, or nearly even with, the water. At the entrance of the mole, on the left, is a ſmall chapel of St Nicholas; and oppoſite, a ſquare tower with ſteps before it, detached, from which a bridge was laid acroſs, to be removed on any alarm. This ſtructure, which is mean, was erected by the Venetians, while at war with the Turks in 1693.

ÆGINETA (Paulus), a celebrated ſurgeon of the iſland of Ægina, from whence he derived his name. According to M. Le Clerc's calculation, he lived in the fourth century; but Abulpharagius the Arabian, who is allowed to give the beſt account of thoſe times, places him with more probability in the ſeventh. His knowledge in ſurgery was very great, and his works are deſervedly famous. Fabricius ab Aquapendente has thought fit to tranſcribe him in a great variety of places. Indeed the doctrine of Paulus Ægineta, together with that of Celſus and Albucaſis, make up the whole text of this author. He is the firſt writer who takes notice of the cathartic quality of rhubarb; and, according to Dr Milward, is the firſt in all antiquity who deſerves the title of a man-midwife.

ÆGINHARD, the celebrated ſecretary and ſuppoſed ſon-in-law of Charlemagne. He is ſaid to have been carried through the ſnow on the ſhoulders of the affectionate and ingenious Imma, to prevent his being tracked from her apartments by the emperor her father: a ſtory which the elegant pen of Addiſon has copied and embelliſhed from an old German chronicle, and inſerted in the 3d volume of the Spectator.—This happy lover (ſuppoſing the ſtory to be true) ſeems to have poſſeſſed a heart not unworthy of ſo enchanting a miſtreſs, and to have returned her affection with the moſt faithful attachment; for there is a letter of Æginhard's ſtill extant, lamenting the death of his wife, which is written in the tendereſt ſtrain of connubial affliction;—it does not, however, expreſs that this lady was the affectionate princeſs, and indeed ſome late critics have proved that Imma was not the daughter of Charlemagne.—But to return to our hiſtorian: He was a native of Germany, and educated by the munificence of his imperial maſter, of which he has left the moſt grateful teſtimony, in his preface to the life of that monarch. Æginhard, after the loſs of his lamented wife, is ſuppoſed to have paſſed the remainder of his days in religious retirement, and to have died ſoon after the year 840. His life of Charlemagne, his annals from 741 to 839, and his letters, are all inſerted in the 2d volume of Ducheſne's Scriptores Francorum. But there is an improved edition of this valuable hiſtorian, with the annotations of Hermann Schminke, in 4to, 1711.

ÆGIPAN, in heathen mythology, a denomination given to the god Pan, becauſe he was repreſented with the horns, legs, feet, &c. of a goat.

ÆGIPHILA, Goat-friend; a genus of the monogynia order, belonging to the tetandria claſs of plants; the characters of which are: The *calyx* is a ſingle-leaved perianthium, bell-ſhap'd, four-tooth'd, looſe, very ſhort, and perſiſtent: The *corolla* conſiſts of one petal; the tubus cylindric, narrower and longer than the calyx; the border divided into four ſegments, flat and equal; the diviſions oblong: The *ſtamina* conſiſt of four erect capillary filaments; the antheræ are incumbent and ſquared: The *piſtillum* has a germen above; a capillary, two-cleft, middle-ſized ſtylus; and a ſimple ſtigma: The *pericarpium* is a roundiſh unilocular berry: The *ſeeds* are four. There is only one ſpecies, a native of Martinique.

ÆGIS, in ancient mythology, a name given to the ſhield or buckler of Jupiter and Pallas.

The goat Amalthea, which had ſuckled Jove, being dead, that god is ſaid to have covered his buckler with the ſkin thereof; whence the appellation *ægis*, from *αιξ, αιγος, ſhe-goat.* Jupiter afterwards reſtoring the beaſt to life again, covered it with a new ſkin, and placed it among the ſtars. As to his buckler, he made a preſent of it to Minerva; whence that goddeſs's buckler is alſo called *ægis.*

Minerva, having killed the Gorgon Meduſa, nailed her head in the middle of the ægis, which henceforth had the faculty of converting into ſtone all thoſe who looked thereon; as Meduſa herſelf had done during her life.

Others take the ægis not to have been a buckler, but a cuiraſs, or breaſt-plate: and it is certain the ægis of Pallas, deſcribed by Virgil, Æn. lib. viii. ver. 435, muſt have been a cuiraſs; ſince that poet ſays expreſsly, that Meduſa's head was on the breaſt of the goddeſs. But the ægis of Jupiter, mentioned a little higher, ver. 354, ſeems to have been a buckler: the words

Cum ſæpe nigrantem
Ægida *concuteret dextra,*

agreeing very well to a buckler; but not at all to a cuiraſs or breaſt-plate.

Servius makes the ſame diſtinction on the two paſſages of Virgil; for on verſe 354, he takes the ægis for the buckler of Jupiter, made, as above-mentioned, of the ſkin of the goat Amalthea; and on verſe 455 he deſcribes the ægis as the armour which covers the breaſt, which in ſpeaking of men is called the *cuiraſs*, and *ægis* in ſpeaking of the gods. Many authors have overlooked theſe diſtinctions for want of going to the ſources.

ÆGISTHUS, in ancient hiſtory, was the ſon of Thyeſtes by his own daughter Pilopeia, who, to conceal her ſhame, expoſed him in the woods: ſome ſay he was taken up by a ſhepherd, and ſuckled by a goat, whence he was called *Ægiſthus.* He corrupted Clytemneſtra the wife of Agamemnon; and with her aſſiſtance ſlew her huſband, and reigned ſeven years in Mycenæ. He was, together with Clytemneſtra, ſlain by Oreſtes. Pompey uſed to call Julius Cæſar *Ægiſthus*, on account of his having corrupted his wife Mutia, whom he afterwards put away, though he had three children by her.

ÆGITHALLUS (anc. geog.), a promontory and citadel of Sicily, between Drepanum and the Emporium Aegiſtanum, afterwards called *Acellus;* corruptly written *Aegitharſos*, in Ptolemy; ſituate near mount Eryx, and now called *Capo di Santo Teodoro.*

ÆGIUM (anc. geog.), a town of Achaia Propria, five miles from the place where Helice ſtood, and famous for the council of the Acheans, which uſually met there, on account either of the dignity or commodious ſituation of the place. It was alſo famous for the worſhip of Ομαγυριος Σευς, *Conventional Jupiter*, and of *Panethæan Ceres.* The territory of Ægium was watered by two rivers, viz. the Phœnix and Meganitas. The epithet is *Ægienſis.* There is a coin in the cabinet of the king of Pruſſia, with the inſcription AIΓI, and the figure of a tortoiſe, which is the ſymbol of Peloponneſus, and leaves no doubt as to the place where it was ſtruck.

ÆGOBOLIUM, in antiquity, the ſacrifice of a goat offered to Cybele. The ægobolium was an expiatory ſacrifice, which bore a near reſemblance to the taurobolium and criobolium, and ſeems to have been ſometimes joined with them.

ÆGOPODIUM, SMALL WILD ANGELICA, GOUTWORT, GOATSFOOT, HERB GERARD, or ASHWEED; a genus of the digynia order, belonging to the pentandria claſs of plants; the characters of which are: The univerſal *calyx* is a manifold convex umbel; the partial one, conſimilar and flat; there is no involucrum; and the proper perianthium is ſcarcely diſcernible: The univerſal *corolla* is uniform, the florets all fertile; the proper one has five inverſe-ovate, concave, equal petals, inflected at the top: The *ſtamina* conſiſt of five ſimple filaments twice the length of the corolla; the antheræ roundiſh: The *piſtillum* has a germen beneath; two purple erect ſtyli the length of the corollet; the ſtigmata are headed: No *pericarpium:* The fruit is ovate, ſtriated, and bipartite: The *ſeeds* are two, ovate, on one ſide convex and ſtriated, and flat on the other. There is but one ſpecies, a native of Britain and other parts of Europe. It is very common under hedges and about gardens; the leaves reſemble thoſe of Angelica, and it carries ſmall white flowers. Its roots run ſo faſt, as to render it a very troubleſome weed.

ÆGOPRICORN, a genus of the monœcia order, belonging to the diandria claſs of plants; the characters of which are: The *calyx* both of the male and female is a tubular perianthium of one leaf divided into three ſegments: *Corolla* wanting in both: The *ſtamina* conſiſt of a ſingle erect filament longer than the calyx, with an ovate anthera: The *piſtillum* has an ovate germen, three divaricated ſtyli, and ſimple perſiſtent ſtigmata: The *pericarpium* is a globular berry, three-grained within, and three-cell'd: The *ſeeds* are ſolitary, and angular on one ſide.—There is but one ſpecies, a native of Surinam.

ÆGOSPOTAMOS (anc. geog.), a river in the Thracian Cherſoneſus, falling with a ſouth-eaſt courſe into the Helleſpont, to the north of Ceſtos; alſo a town, ſtation, or road for ſhips, at its mouth. Here the Athenians, under Conon, through the fault of his colleague Iſocrates received a ſignal overthrow from the Lacedemonians under Lyſander, which was followed by the taking of Athens, and put an end to the Peloponneſian war. The Athenian fleet having followed the Lacedemonians, anchored in the road, over againſt the enemy, who lay before Lampſacus. The Helleſpont is not above two thouſand paces broad in that place. The two armies ſeeing themſelves ſo near each other, expected only to reſt that day, and were in hopes of coming to a battle on the next.

But Lyſander had another deſign in his view. He commanded the ſeamen and pilots to go on board their galleys, as if they were in reality to fight the next morning at break of day, to hold themſelves in readineſs, and to wait his orders with profound ſilence. He commanded the land-army in like manner to draw up in battle upon the coaſt, and to wait the day without noiſe. On the morrow, as ſoon as the ſun was riſen, the Athenians began to row towards them with their whole fleet in one line, and to bid them defiance. Lyſander, though his ſhips were ranged in order of battle, with their heads towards the enemy, lay ſtill without making any movement. In the evening, when the Athenians withdrew, he did not ſuffer his ſoldiers to go aſhore, till two or three galleys, which he had ſent out to obſerve them, were returned with advice that they had ſeen the enemy land. The next day paſſed in the ſame manner, as did the third and fourth. Such a conduct, which argued reſerve and apprehenſion, extremely augmented the ſecurity and boldneſs of the Athenians, and inſpired them with an extreme contempt for an army, which fear, in their ſenſe, prevented from ſhowing themſelves, and attempting any thing.

Whilſt this paſſed, Alcibiades, who was near the fleet, took horſe, and came to the Athenian generals; to whom he repreſented, that they kept upon a very diſadvantageous coaſt, where there were neither ports nor cities in the neighbourhood; that they were obliged to bring their proviſions from Ceſtos with great danger and difficulty; and that they were very much in the wrong to ſuffer the ſoldiers and mariners of the fleet, as ſoon as they were aſhore, to ſtraggle and diſperſe themſelves at their own pleaſure, whilſt they were faced in view by the enemy's fleet, accuſtomed to execute the orders of their general with the readieſt obedience, and upon the ſlighteſt ſignal. He offered alſo to attack the enemy by land with a ſtrong body of Thracian troops, and to force them to a battle. The generals, eſpecially Tydeus and Menander, jealous of their command, did not content themſelves with refuſing his offers, from the opinion, that if the event proved unfortunate, the whole blame would fall on them, and if favourable, that Alcibiades alone would have the honour of it; but rejected alſo with inſult his wiſe and ſalutary counſel, as if a man in diſgrace loſt his ſenſe and abilities with the favour of the commonwealth. Alcibiades withdrew.

The fifth day the Athenians preſented themſelves again, and offered battle; retiring in the evening according to cuſtom with more inſulting airs than the days before. Lyſander, as uſual, detached ſome galleys to obſerve them, with orders to return with the utmoſt diligence when they ſaw the Athenians landed, and to put up a brazen buckler at each ſhip's head as ſoon as they reached the middle of the channel. Himſelf in the mean time ran through the whole line in his galley, exhorting the pilots and officers to hold the ſeamen and ſoldiers in readineſs to row and fight on the firſt ſignal.

As ſoon as the bucklers were put up in the ſhips heads, and the admiral-galley had given the ſignal by the ſound of trumpet, the whole fleet ſet forward in good order. The land-army at the ſame time made all poſſible haſte to the top of the promontory to ſee the battle. The ſtrait that ſeparates the two continents in this place is about fifteen ſtadia, or three quarters of a league in breadth; which ſpace was preſently cleared through the activity and diligence of the rowers. Conon the Athenian general was the firſt who perceived from ſhore, the fleet advance in good order to attack him; upon which he immediately cried out for the troops to embark. In the height of ſorrow and trouble, ſome he called to by their names, ſome he conjured, and others he forced to go on board their galleys; but all his endeavours and emotion were ineffectual, the ſoldiers being diſperſed on all ſides. For they were no ſooner come on ſhore, than ſome ran to the ſutlers, ſome to walk in the country, ſome to ſleep in their tents, and others had begun to dreſs their ſuppers. This proceeded from the want of vigilance and experience in their generals, who, not ſuſpecting the leaſt danger, indulged themſelves in taking their repoſe, and gave their ſoldiers the ſame liberty.

The enemy had already fallen on with loud cries and a great noiſe of their oars, when Conon, diſengaging himſelf with nine galleys, of which number was the ſacred ſhip called the *Paralian*, ſtood away for Cyprus, where he took refuge with Evagoras. The Peloponneſians, falling upon the reſt of the fleet, took immediately the galleys which were empty, and diſabled and deſtroyed ſuch as begun to fill with men. The ſoldiers, who ran without order or arms to their relief, were either killed in the endeavour to get on board, or flying on ſhore were cut to pieces by the enemy, who landed in purſuit of them. Lyſander took 3000 priſoners, with all the generals, and the whole fleet. After having plundered the camp, and faſtened the enemy's galleys to the ſtern of his own, he returned to Lampſacus amidſt the ſound of flutes and ſongs of triumph. It was his glory to have atchieved one of the greateſt military exploits recorded in hiſtory with little or no loſs, and to have terminated a war in the ſmall ſpace of an hour, which had already laſted 27 years, and which, perhaps, without him, had been of much longer continuance.

ÆGYPT. See EGYPT.

ÆGYPTIACUM, in pharmacy, the name of ſeveral detergent ointments; which are deſcribed under the article OINTMENT.

ÆGYPTILLA, in natural hiſtory, the name of a ſtone deſcribed by the ancients, and ſaid, by ſome authors, to have the remarkable quality of giving water the colour and taſte of wine. This ſeems a very imaginary virtue, as are indeed too many of thoſe in former ages attributed to ſtones. The deſcriptions left us of this remarkable foſſil tell us, that it was variegated with, or compoſed of, veins of black and white, or black and blueiſh, with ſometimes a plate or vein of whitiſh red. The authors of theſe accounts ſeem to have underſtood by this name the ſeveral ſtones of the onyx, ſardonyx, and camæa kind; all which we have at preſent common among us, but none of which poſſeſs any ſuch ſtrange properties.

ÆGYPTUS, (fab. hiſt.) was the ſon of Beleus, and brother of Danaus. See BELIDES.

ÆINATÆ, in antiquity, a denomination given to the ſenators of Miletus, becauſe they held their deliberations on board a ſhip, and never returned to land till matters had been agreed on.

ÆLIAN (Claudius), born at Præneſte in Italy. He taught rhetoric at Rome, according to Perizonius, under the emperor Alexander Severus. He was ſirnamed Μελιγλωσσος, *Honey-mouth*, on account of the ſweetneſs of his ſtyle. He was likewiſe honoured with the title of Sophiſt, an appellation in his days given only to men of learning and wiſdom. He loved retirement, and devoted himſelf to ſtudy. He greatly admired and ſtudied Plato, Ariſtotle, Iſocrates, Plutarch, Homer, Anacreon, Archilochus, &c. and, though a Roman, gives the preference to the writers of the Greek nation. His two moſt celebrated works are, his Various Hiſtory, and Hiſtory of Animals. He compoſed likewiſe a book on Providence, mentioned by Euſtathius; and another on Divine Appearances, or The Declarations of Providence. There have been ſeveral editions of his Various Hiſtory.

ÆLI PONS (anc. geog.), one of the fortreſſes near the wall or rampart, or, in the words of the Notitia, through the line of the hither wall; built, as is thought, by Adrian*. Now Porteland, (Camden), in Northumberland, between Newcaſtle and Morpeth.

*See *Adrian* (emperor.)

ÆLIUS PONS, now *il Ponte S. Angelo*, a ſtone-bridge at Rome, over the Tyber, which leads to the Burgo and Vatican from the city, along Adrian's mole, built by the emperor Adrian.

ÆLFRED. See ALFRED.

ÆLURUS, in Egyptian mythology, the deity or god of cats; repreſented ſometimes like a cat, and ſometimes like a man with a cat's head. The Egyptians had ſo ſuperſtitious a regard for this animal, that the killing it, whether by accident or deſign, was puniſhed with death: and Diodorus relates, that, in the time of extreme famine, they choſe rather to eat one another than touch theſe ſacred animals.

AEM, AM, or AME, a liquid meaſure uſed in moſt parts of Germany; but different in different towns; the aem commonly contains 20 vertils, or 80 maſſes; that of Heidelbergh is equal to 48 maſſes; and that of Wirtembergh to 160 maſſes. See AAM.

ÆMILIUS (Paulus), the ſon of Lucius Paulus, who was killed at the battle of Cannæ, was twice conſul. In his firſt conſulate he triumphed over the Ligurians; and in the ſecond ſubdued Perſeus king of Macedonia, and reduced that country to a Roman province, on which he obtained the ſurname of Macedonicus. He returned to Rome loaded with glory, and triumphed for three days. He died 168 years before Chriſt.

ÆMILIUS (Paulus), a celebrated hiſtorian, born at Verona, who obtained ſuch reputation in Italy, that he was invited into France by the cardinal of Bourbon, in the reign of Lewis XII. in order to write the hiſtory of the kings of France in Latin, and was given a canonry in the cathedral of Paris. He was near 30 years in writing that hiſtory, which has been greatly admired; and died at Paris on the 5th of of May 1529.

ÆMOBOLIUM, in antiquity, the blood of a bull or ram offered in the ſacrifices, called *taurobolia* and *criobolia;* in which ſenſe the word occurs in ancient inſcriptions.

ÆNARIA (anc. geog.), an iſland on the bay of Cumæ, or over-againſt Cumæ in Italy, (Pliny.) It is alſo called *Inarime*, (Virgil); and now *Iſchia:* ſcarce three miles diſtant from the coaſt, and the promontory Miſenus to the weſt; 20 miles in compaſs; called *Pithecuſa* by the Greeks. It is one of the Oenotrides, and fenced round by very high rocks, ſo as to be inacceſſible but on one ſide; it was formerly famous for its earthen ware. See ISCHIA.

ÆNEAS (fab. hiſt.), a famous Trojan prince, the ſon of Anchiſes and Venus. At the deſtruction of Troy, he bore his aged father on his back, and ſaved him from the Greeks; but being too ſolicitous about his ſon and houſehold-gods, loſt his wife Creuſa in the eſcape. Landing in Africa, he was kindly received by queen Dido: but quitting her coaſt, he arrived in Italy, where he married Lavinia the daughter of king Latinus, and defeated Turnus, to whom ſhe had been contracted. After the death of his father-in-law, he was made king of the Latins, over whom he reigned three years: but joining with the Aborigines, he was ſlain in a battle againſt the Tuſcans. Virgil has rendered the name of this prince immortal, by making him the hero of his poem. See ÆNEID.

ÆNEAS SYLVIUS, (Pope). See PIUS II.

ÆNEATORES, in antiquity, the muſicians in an army, including thoſe who played trumpets, horns, &c. The word is formed from *æneus*, on account of the brazen inſtruments uſed by them.

Blair's Lectures.

ÆNEID, the name of Virgil's celebrated epic poem. The ſubject of the Æneid, which is the eſtabliſhment of Æneas in Italy, is extremely happy. Nothing could be more intereſting to the Romans than to look back to their origin from ſo famous a hero. While the object was ſplendid itſelf, the traditionary hiſtory of his country opened intereſting fields to the poet; and he could glance at all the future great exploits of the Romans, in its ancient and fabulous ſtate.

As to the unity of action, it is perfectly well preſerved in the Æneid. The ſettlement of Æneas, by the order of the gods, is conſtantly kept in view. The epiſodes are linked properly with the main ſubject. The nodus, or intrigue of the poem, is happily managed. The wrath of Juno, who oppoſes Æneas, gives riſe to all his difficulties, and connects the human with the celeſtial operations throughout the whole poem.

One great imperfection of the Æneid, however, is, that there are almoſt no marked characters in it. Achates, Cloanthes, Gyas, and other Trojan heroes who accompanied Æneas into Italy, are inſipid figures. Even Æneas himſelf is without intereſt. The character of Dido is the beſt ſupported in the whole Æneid.

The principal excellency of Virgil is tenderneſs. His ſoul was full of ſenſibility. He muſt have felt himſelf all the affecting circumſtances in the ſcenes he deſcribes; and he knew how to touch the heart by a ſingle ſtroke. In an epic poem this merit is the next to ſublimity. The ſecond book of the Æneid is one of the greateſt maſter-pieces that ever was executed. The death of old Priam, and the family-pieces of Æneas, Anchiſes, and Creuſa, are as tender as can be conceived. In the fourth book, the unhappy paſſion and death of Dido are admirable. The epiſodes of Pallas and Evander, of Niſus and Euryalus, of Lauſus and Mezentius, are all ſuperlatively fine.

In his battles, Virgil is far inferior to Homer. But in the important epiſode, the deſcent into hell, he has outdone Homer by many degrees. There is nothing in antiquity to equal the ſixth book of the Æneid.

ÆNGINA, one of the iſlands of the Archipelago. It lies in the bay of Engia, and the town of that name contains about 800 houſes and a caſtle; and near it are the ruins of a magnificent ſtructure, which was probably a temple.

ÆNIGMA, denotes any dark ſaying, wherein ſome well-known thing is concealed under obſcure language. The word is Greek, Αινιγμα, formed of αινιττεσθαι, *obſcure innuere*, to hint a thing darkly, and of αινος, an obſcure ſpeech or diſcourſe. The popular name is *riddle;* from the Belgic *raeden*, or the Saxon *araethan*, to interpret. Fa. Bouhours, in the memoirs of Trevoux, defines an ænigma, A diſcourſe of painting, including ſome hidden meaning, which is propoſed to be gueſſed.

Painted ÆNIGMAS, are repreſentations of the works of nature, or art, concealed under human figures, drawn from hiſtory, or fable.

A Verbal ÆNIGMA, is a witty, artful, and abſtruſe deſcription of any thing.—In a general ſenſe, every dark ſaying, every difficult queſtion, every parable, may paſs for an *ænigma*. Hence obſcure laws are called *Ænigmata Juris*. The alchemiſts are great dealers in the ænigmatic language, their proceſſes for the philoſopher's ſtone being generally wrapped up in riddles: e. g. *Fac ex mare et fæmina circulum, inde quadrangulum, hinc triangulum, fac circulum, et habebis lapidem philoſophorum.*—F. Meneſtrier has attempted to reduce the compoſition and reſolution of ænigmas to a kind of art, with fixed rules and principles, which he calls the philoſophy of *ænigmatic* images.

The Subject of an ÆNIGMA, or the thing to be concealed and made a myſtery of, he juſtly obſerves, ought not to be ſuch in itſelf; but, on the contrary, common, obvious, and eaſy to be conceived. It is to be taken, either from nature, as the heavens, or ſtars; or from art, as painting, the compaſs, a mirror, or the like.

The Form of ÆNIGMAS conſiſts in the words, which, whether they be in proſe or verſe, contain either ſome deſcription, a queſtion, or a proſopopæia. The laſt kind are the moſt pleaſing, inaſmuch as they give life and action to things which otherwiſe have them not. To make an ænigma, therefore, two things are to be pitched on, which bear ſome reſemblance to each other; as the ſun and a monarch; or a ſhip and a houſe: and on this reſemblance is to be raiſed a ſuperſtructure of contrarieties to amuſe and perplex. It is eaſier to find great ſubjects for ænigmas in figures than in words, inaſmuch as painting attracts the eyes and excites the attention to diſcover the ſenſe. The ſubjects of ænigmas in painting, are to be taken either from hiſtory or fable: the compoſition here is a kind of metamorphoſis,

tamorphoſis, wherein e. g. human figures are changed into trees, and rivers into metals. It is eſſential to ænigmas, that the hiſtory or fable, under which they are preſented, be known to every body; otherwiſe it will be two ænigmas inſtead of one; the firſt of the hiſtory or fable, the ſecond of the ſenſe in which it is to be taken. Another eſſential rule of the ænigma is, that it only admits of one ſenſe. Every ænigma which is ſuſceptive of different interpretations, all equally natural, is ſo far imperfect. What gives a kind of erudition to an ænigma, is an invention of figures in ſituations, geſtures, colours, &c. authoriſed by paſſages of the poets, the cuſtoms of artiſts in ſtatues, baſſo relievos, inſcriptions, and medals.—In foreign colleges,

The Explication of ÆNIGMAS makes a conſiderable exerciſe; and that one of the moſt difficult and amuſing where wit and penetration have the largeſt field.—By explaining an ænigma, is meant the finding a motto correſponding to the action and perſons repreſented in a picture, taken either from hiſtory or mythology. The great art of this exerciſe conſiſts in the choice of a motto, which either by itſelf, or the circumſtances of time, place, perſon who ſpeaks, or thoſe before whom he is ſpeaking, may divert the ſpectators, and furniſh occaſions for ſtrokes of wit; alſo in ſhowing to advantage the conformities between the figure and thing figured, giving ingenious turns to the reaſons employed to ſupport what is advanced, and in artfully introducing pieces of poetry to illuſtrate the ſubject and awaken the attention of the audience.

As to the ſolution of ænigmas, it may be obſerved, that thoſe expreſſed by figures are more difficult to explain than thoſe conſiſting of words, by reaſon images may ſignify more things than words can; ſo that to fix them to a particular ſenſe, we muſt apply every ſituation, ſymbol, &c. and without omitting a circumſtance.—As there are few perſons in hiſtory, or mythology, but have ſome particular character of vice or virtue, we are, before all things, to attend to this *character*, in order to divine what the figure of a perſon repreſented in a painting ſignifies, and to find what agreement this may have with the ſubject whereof we would explain it. Thus, if Proteus be repreſented in a picture, it may be taken to denote *inconſtancy*, and applied either to a phyſical or a moral ſubject, whoſe character is to be changeable; e. g. an almanack, which expreſſes the weather, the ſeaſons, heat, cold, ſtorms, and the like. The *colours* of figures may alſo help to unriddle what they mean: *white*, for inſtance, is a mark of innocence, *red* of modeſty, *green* of hope, *black* of ſorrow, &c. When figures are accompanied with *ſymbols*, they are leſs precarious; theſe being, as it were, the ſoul of ænigmas, and the key that opens the myſtery of them. Of all the kinds of ſymbols which may be met with in thoſe who have treated profeſſedly on the ſubject, the only truly ænigmatical are thoſe of Pythagoras, which, under dark proverbs, hold forth leſſons of morality; as when he ſays, *Stateram ne tranſilias*, to ſignify, Do no injuſtice.

But it muſt be added, that we meet with ſome ænigmas in hiſtory, complicated to a degree, which much tranſcends all rules, and has given great perplexity to the interpreters of them. Such is that celebrated ancient one, *Ælia Lælia Criſpis*, about which many of the learned have puzzled their heads. There are two exemplars of it: one found 140 years ago, on a marble near Bolognia: the other in an ancient MS. written in Gothic letters, at Milan. It is controverted between the two cities, which is to be reputed the more authentic.

The Bononian *Ænigma.*

D. M.
Ælia Lælia Criſpis,
Nec vir, nec mulier,
Nec androgyna;
Nec puella, nec juvenis,
Nec anus;
Nec caſta, nec meretrix,
Nec pudica;
Sed omnia:
Sublata
Neque fame, neque ferro,
Neque veneno:
Sed omnibus:
Nec cœlo, nec terris,
Nec aquis,
Sed ubique jacet.
Lucius Agatho Priſcius,
Nec maritus, nec amator,
Nec neceſſarius;
Neque mærens, neque gaudens,
Neque flens;
Hanc,
Nec molem, nec pyramidem,
Nec ſepulchrum,
Sed omnia,
Scit et neſcit, cui poſuerit.

That is to ſay, *To the gods manes, Ælia Lælia Criſpis, neither man, nor woman, nor hermaphrodite; neither girl, nor young woman, nor old; neither chaſte, nor a whore; but all theſe: killed neither by hunger, nor ſteel nor poiſon; but by all theſe: reſts neither in heaven, nor on earth, nor in the waters; but every where. Lucius Agatho Priſcius, neither her huſband, nor lover, nor friend; neither ſorrowful, nor joyful, nor weeping, certain, or uncertain, to whom he rears this monument, neither erects her a temple, nor a pyramid, nor a tomb, but all theſe.* In the MS. at Milan, inſtead of *D. M.* we find *A. M. P. P. D.* and at the end the following addition:

Hoc eſt ſepulchrum intus cadaver non habens,
Hoc eſt cadaver ſepulchrum extra non habens,
Sed cadaver idum eſt et ſepulchrum.

We find near 50 ſeveral ſolutions of this ænigma advanced by learned men. Marius Michael Angelus maintains *Ælia Lælia Criſpis* to ſignify rain-water falling into the ſea. Ri. Vitus firſt explained it of Niobe turned to a ſtone, afterwards of the rational ſoul, and afterwards of the Platonic idea; Jo. Turrius, of the *materia prima*; Fr. Schottus, of an eunuch; Nic. Bernardus, of the philoſopher's ſtone, in which he is followed by Borrichius; Zach. Pontinus, of three human bodies in the ſame ſituation, and buried by three different men at the ſame time; Neſmondius, of a law-ſuit; Jo. Gaſ. Gerartius, of love; Zu. Boxhornius, of a ſhadow; P. Terronus, of muſic; Fort Licetus, of generation, friendſhip, and privation: M. Ov. Montalbanus, of hemp; Car. Cæſ. Malvaſia, of an abortive girl promiſed in marriage; Pet. Mengulus, of the rule of chaſtity, preſcribed by the founder of the military religion of St Mary; M. de Ciconia, of pope Joan; Heumanus, of Lot's wife; and laſtly, J. C. S. an anonymous writer in the Leipſic Acts, of the Chriſtian church.

ÆNIGMATOGRAPHY, or ÆNIGMATHOLOGY, the art of reſolving or making ænigmas.

ÆNONA (anc. geog.), a city of Liburnia, called by Pliny *Civitas Praſini*, the reaſon of which is unknown; alſo *Ænona*, and is now called *Nona;* on the Adriatic, by which it is for the greater part ſurrounded; over-againſt the iſland Giſſa, from which it is diſtant four miles to the weſt. E. Long. 16°, Lat. 28°.

ÆNUS (anc. geog.), now the *Inn*, a river of Germany, which, riſing in the country of the Griſons, out of the Alps, in the diſtrict called Gottes-haus-punt, runs through the Griſons, the county of Tyrol, the duchy of Bavaria, and through Paſſau into the Danube.

ÆNUS, *Ænos*, or *Ænum*, (anc. geog.), a town of Thrace, ſituate on the eaſt-moſt mouth of the Hebrus, which has two mouths; and ſaid to be built by the Cumeans. It was a free town, in which ſtood the tomb of Polydorus, (Pliny); *Ænius* is the epithet. Here the brother of Cato Uticenſis died, and was honoured with a monument of marble in the forum of the Ænii, (Plutarch); called *Ænei*, (Stephanus); Livy ſays that the town was otherwiſe called *Abſynthus*. Now *Eno*.

ÆNITHOLOGIUS, in poetry, a verſe of two dactyls and three trochæi; as, *Prælia dira placent truci juventæ*.

ÆOLIÆ INSULÆ, now *Iſole di Lipari*, (anc. geog.), ſeven iſlands, ſituated between Sicily and Italy, ſo called from Æolus, who reigned there about the time of the Trojan war. The Greeks call them *Hephæſtiades;* and the Romans *Vulcaniæ*, from their fiery eruptions. They are alſo called *Liparæorum Inſulæ*, from their principal iſland Lipara. Dionyſius Periegetes calls them Πλυται, becauſe circumnavigable.

ÆOLIC, in a general ſenſe, denotes ſomething belonging to Æolis.

ÆOLIC, or ÆOLIAN, in grammar, denotes one of the five dialects of the Greek tongue. It was firſt uſed in Bœotia; whence it paſſed into Æolia, and was that which Sappho and Alcæus wrote in. The Æolic dialect generally throws out the aſpirate or ſharp ſpirit, and agrees in ſo many things with the DORIC dialect, that the two are uſually confounded together.

The *Æolic digama* is a name given to the letter F, which the Æolians uſed to prefix to words beginning with vowels, as Ϝοινος, for οινος; alſo to inſert between vowels, as οϜις, for οις.

ÆOLIC Verſe, in proſody, a verſe conſiſting of an iambus, or ſpondee; then of two anapeſts, ſeparated by a long ſyllable; and, laſtly, of another ſyllable. Such as, *O ſtelliferi conditor orbis*. This is otherwiſe called *eulogic* verſe; and, from the chief poets who uſed it, *Archilochian* and *Pindaric*.

ÆOLIPILE, in hydraulics, is a hollow ball of metal, generally uſed in courſes of experimental philoſophy, in order to demonſtrate the poſſibility of converting water into an elaſtic ſteam or vapour by heat. The inſtrument, therefore, conſiſts of a ſlender neck, or pipe, having a narrow orifice inſerted into the ball by means of a ſhouldered ſcrew. This pipe being taken out, the ball is filled almoſt full of water, and the pipe being again ſcrewed in, the ball is placed on a pan of kindled charcoal, where it is well heated, and there iſſues from the orifice a vapour, with prodigious violence and great noiſe, which continues till all the included water is diſcharged. The ſtronger the fire is, the more elaſtic and violent will be the ſteam; but care muſt be taken that the ſmall orifice of the pipe be not, by any accident, ſtopped up; becauſe the inſtrument would in that caſe infallibly burſt in pieces, with ſuch violence as may greatly endanger the lives of the perſons near it. Another way of introducing the water is to heat the ball red-hot when empty, which will drive out almoſt all the air: and then by ſuddenly immerging it in water, the preſſure of the atmoſphere will force in the fluid, till it is nearly full. Des Cartes and others have uſed this inſtrument to account for the natural cauſe and generation of the wind: and hence it was called *Æolopila:* q. d. *pila Æoli*, the ball of Æolus or of the god of the winds.

ÆOLIS, or ÆOLIA (anc. geog.), a country of the Hither Aſia, ſettled by colonies of Æolian Greeks. Taken at large, it comprehends all Troas, and the coaſt of the Helleſpont to the Propontis, becauſe in thoſe parts there were ſeveral Æolian colonies: more ſtrictly, it is ſituated between Troas to the north, and Ionia to the ſouth. The people are called *Æoles*, or *Æolii*.

ÆOLIUM MARE (anc. geog.), a part of the Egean ſea, waſhing Æolis; called alſo *Myſium*, from Myſia. Now called, *Golfo di Smyrna*.

ÆOLUS, in heathen mythology, the god of the winds, was ſaid to be the ſon of Jupiter by Acaſta, or Sigeſia, the daughter of Hippotus; or, according to others, the ſon of Hippotus by Meneclea, daughter of Hyllus king of Lipara. He dwelt in the iſland Strongyle, now called *Strombolo*, one of the ſeven iſlands called *Æolian* from their being under the dominion of Æolus. Others ſay, that his reſidence was at Regium, in Italy; and others again place him in the iſland Lipara. He is repreſented as having authority over the winds, which he held enchained in a vaſt cavern, to prevent their continuing the devaſtations they had been guilty of before they were put under his direction. Mythologiſts explain the original of theſe fables, by ſaying, that he was a wiſe and good prince; and, being ſkilled in aſtronomy, was able, by the flux and reflux of the tides, and the nature of the volcano in the iſland Strongyle, to foretel ſtorms and tempeſts.

Harp of ÆOLUS, or the Æolian lyre. See ACOUSTICS, n° 10.

ÆON, a Greek word, properly ſignifying the age or duration of any thing.

ÆON, among the followers of Plato, was uſed to ſignify any virtue, attribute, or perfection: hence they repreſented the deity as an aſſemblage of all poſſible æons; and called him *pleroma*, a Greek term ſignifying *fulneſs*. The Valentinians, who, in the firſt ages of the church, blended the conceits of the Jewiſh cabaliſts, the Platoniſts, and the Chaldean philoſophers, with the ſimplicity of the Chriſtian doctrine, invented a kind of Theogony, or Genealogy of Gods (not unlike that of Heſiod), whom they called by ſeveral glorious names, and all by the general appellation of ÆONS: among which they reckoned Ζωη, *Life;* Λογος, *Word;* Μονογονης, *Only-begotten;* Πληρωμα, *Fulneſs;* and many other divine powers and emanations, amounting in number to thirty: which they fancied to be ſucceſſively derived from one another; and all from one ſelf-originated deity, named *Bythus*, i. e. *profound* or *unfathomable;* whom they call likewiſe, *The moſt high and ineffable Father*. See VALENTINIANS.

ÆORA, among ancient writers on medicine, is uſed for geſtation; which ſort of exerciſe was often preſcribed by the phyſicians of thoſe days. Other exerciſes conſiſted principally in the motion of the body; but in the *æora* the limbs were at reſt, while the body was carried about and moved from place to place, in ſuch a manner as the phyſician preſcribed. It had therefore the advantages of exerciſe, without the fatigue of it.—This exerciſe was promoted ſeveral ways: ſometimes the patient was laid in a ſort of hammock, ſupported by ropes, and moved backward and forward; ſometimes his bed run nimbly on its feet. And beſides theſe, the ſeveral ways of travelling were accounted ſpecies of the *æora*, whether in the litter, in a boat or ſhip, or on even ground in a chariot.—Aſclepiades was the firſt who brought geſtation into practice, which was uſed as a means to recover ſtrength after a fever, &c.

ÆQUANA JUGA, (anc. geog.); mountains of Picenum, in the kingdom of Naples, now called *Montagna di Sorrento*, denominated from the town Æqua, which being deſtroyed, was replaced by Vicus, now *Vico di Sorrento;* called alſo *Æquana*, Sil. Italicus.

ÆQUIMELIUM, in antiquity, a place in Rome, where ſtood the houſe of Spurius Melius, who, by largeſſes corrupting the people, affected the ſupreme power: refuſing to appear before the dictator Cincinnatus, he was ſlain by Servilius Ahala, maſter of the horſe; his houſe was razed to the ground; and the ſpot on which it ſtood was called *Area Equimelii*. (Livy.)

ÆRA, in chronology, a fixed point of time from whence any number of years is begun to be counted.

It is ſometimes alſo written in ancient authors *Era*. The origin of the term is conteſted, though it is generally allowed to have had its riſe in Spain. Sepulveda ſuppoſes it formed from A. ER. A. the notæ or abbreviatures of the words *annus erat Auguſti*, occaſioned by the Spaniards beginning their computation from the time their country came under the dominion of Auguſtus, or that of receiving the Roman calendar. This opinion, however ingenious, is rejected by Scaliger, not only on account that in the ancient abbreviatures *A* never ſtood for *annis*, unleſs when preceded by *V* for *vixit;* and that it ſeems improbable they ſhould put ER for *erat*, and the letter A, without any diſcrimination, both for *annis* and *Auguſtus*. Voſſius nevertheleſs favours the conjecture, and judges it at leaſt as probable, as either that of Iſidore, who derives *æra* from *æs*, the "tribute-money," wherewith Auguſtus taxed the world: or that of Scaliger himſelf, who deduces it likewiſe from *æs*, though in a different manner. *Æs*, he obſerves, was uſed among the ancients for an *article* or *item* in an account; and hence it came alſo to ſtand for a ſum or number itſelf. From the plural *æra*, came by corruption *æra*, *æram*, in the ſingular; much as *Oſti*, *Oſtiam*, the name of a place, from *Oſtia*, the mouths of the Tyber.

The difference between the terms *æra* and *epoch* is, that the æras are certain points fixed by ſome people, or nation; and the epochs are points fixed by chronologiſts and hiſtorians. The idea of an æra comprehends alſo a certain ſucceſſion of years proceeding from a fixed point of time, and the epoch is that point itſelf. Thus the Chriſtian æra began at the epoch of the birth of Jeſus Chriſt. See CHRONOLOGY, where the different Æras, &c. are enumerated and explained.

ÆRARIUM, the treaſury or place where the public money was depoſited amongſt the Romans.

ÆRARIUM *Sanctius* contained the monies ariſing from the twentieth part of all legacies: this was kept for the extreme neceſſities of the ſtate.

ÆRARIUM *Privatum* was the emperor's privy purſe, or the place where the money ariſing from his private patrimony was depoſited.

ÆRARIUM *Viceſimarum*, the place where the money ariſing from the taxes levied from foreign countries was laid up, ſo called becauſe it moſt commonly conſiſted of a twentieth part of the produce.

ÆRARIUM *Ilithyæ*, or *Junonis Lucinæ*, was where the monies were depoſited which parents paid for the birth of each child.

There are ſeveral other treaſuries mentioned in hiſtory, as the *ærarium Juventutis*, *Veneris*, &c. The temple of Saturn was the public treaſury of Rome, either becauſe Saturn firſt taught the Italians to coin money, or, which is moſt likely, becauſe this temple was the ſtrongeſt and moſt ſecure, and therefore the fitteſt place for that purpoſe.

Ærarium differs from *fiſcus*, as the firſt contained the public money, the ſecond that of the prince. The two are, however, ſometimes indiſcriminately uſed for each other.

ÆRARIUS, a name given by the Romans to a degraded citizen, who had been ſtruck off the liſt of his century. Such perſons were ſo called becauſe they were liable to all the taxes *(æra)*, without enjoying any of its privileges.

The *ærarii* were incapable of making a will, of inheriting, of voting in aſſemblies, of enjoying any poſt of honour or profit; in effect, were only ſubject to the burdens, without the benefits of ſociety; yet they retained their freedom, and were not reduced to the condition of ſlaves. To be made an *ærarius* was a puniſhment inflicted for ſome offence, and reputed one degree more ſevere than to be expelled a tribe, *tribu moveri*.

ÆRARIUS was alſo an officer inſtituted by Alexander Severus, for the diſtribution of the money given in largeſſes to the ſoldiery, or people.

ÆRARIUS was alſo uſed for a perſon employed in coining or working braſs.

Theſe are ſometimes called *ærarii fuſores:* at other times *ærarius* is diſtinguiſhed from *fuſor;* the former anſwering to what we now call copperſmiths, the latter to founders.

ÆRARIUS was likewiſe applied to a ſoldier who receives pay.

AERIA, or EERIA (anc. geog.), the ancient name of Egypt: the ſcholiaſt on Apollonius Rhodius, ſays, that not only Theſſaly, but Egypt, was called ’Ηερια by the Greeks, which Euſebius alſo confirms: and hence Apollinarius, in his tranſlation of the 114th Pſalm, uſes it for Egypt. Heſychius applies this name to Ethiopia.

AERIAL, in a general ſenſe, denotes ſomething partaking of the nature of air; thus, aërial ſubſtance, aërial particles, &c.

Aerial Perſpective. See Perspective and Painting.

AERIANS, in church-hiſtory, a branch of Arians, who, to the doctrines of that ſect, added ſome peculiar dogmas of their own; as, that there is no difference between biſhops and prieſts; a doctrine maintained by many modern divines, particularly of the preſbyterian and reformed churches. The ſect received its denomination from Aerius an Armenian prieſt of the fourth century. He founded his doctrine chiefly upon ſome paſſages in St Paul; and, among others, upon that in 1 Tim. iv. 14. where the apoſtle exhorts him not to neglect *the gift he had received by the laying on of the hands of the Preſbytery.* Here, obſerves Aerius, are no mention of biſhops: on the contrary, Timothy evidently received his ordination from the preſbyters or prieſts.—Epiphanius zealouſly maintains the ſuperiority of biſhops againſt the Aerians. The word *preſbytery,* uſed by the apoſtle, he obſerves, includes both biſhops and prieſts; the whole ſenate or aſſembly of the eccleſiaſtics of the place.

Flos Æris, among Alchemiſts, ſmall ſcales procured from copper melted by a ſtrong heat; it is ſometimes uſed for ærugo or verdigris.

AEROGRAPHY, from αηρ, *air,* and γραφω, *I deſcribe;* a deſcription of the air, or atmoſphere, its limits, dimenſions, properties, &c.—This amounts to much the ſame with aerology, unleſs we ſuppoſe the latter to enter into the rational, and the former to confine itſelf to a deſcription of the more obvious affections thereof. See Atmosphere.

AEROLOGY,

THE doctrine or ſcience of Air, its nature and different ſpecies, with their ingredients, properties, phenomena, and uſes.

Air, in a general ſenſe, is that inviſible fluid everywhere ſurrounding the globe; on which depends not only animal but vegetable life; and which ſeems, in ſhort, to be one of the great agents employed by nature in carrying on her operations throughout the world.

Though the attention of philoſophers has in all ages been engaged in ſome meaſure by inquiries concerning the nature of the atmoſphere, yet till within theſe laſt 30 years, little more than the mere mechanical action of this fluid was diſcovered, with the exiſtence of ſome anomalous and permanently elaſtic vapours, whoſe properties and relation to the air we breathe were almoſt entirely unknown. Within the above-mentioned period, however, the diſcoveries concerning the conſtituent parts of the atmoſphere itſelf, as well as the nature of the different permanently elaſtic fluids which go under the general name of *air,* have been ſo numerous and rapid, that they have at once raiſed this ſubject to the dignity of a *Science,* and now form a very conſiderable, as well as important, part of the modern ſyſtem of natural philoſophy.

Utility of the ſubject.

Thoſe diſcoveries, indeed, have not been more intereſting to philoſophers, than uſeful to ſcience and beneficial to ſociety. Many perplexing proceſſes in chemiſtry have been explained in conſequence of them, ſeveral have been facilitated, and a number of new and uſeful ones have been introduced. The phenomena attending metallic calcinations and reductions have been greatly elucidated. The knowledge of the uſe of the air in reſpiration; the method of aſcertaining its purity and fitneſs for that function; the inveſtigation of dephlogiſticated air; the method of impregnating water with fixed air; are all calculated to anſwer purpoſes of the higheſt utility. The medicinal properties of fixed air have been in a great meaſure aſcertained, and its antiſceptic qualities in other reſpects promiſe to be of conſiderable advantage. The method of aſcertaining the purity of the air of a place, and the manner of ventilating an apartment, are of great uſe for thoſe concerned in public buildings. In ſhort, there is perhaps no ſtation in life where ſome knowledge of this ſubject may not be of uſe.

Sect. I. *Of the general Conſtitution, Mechanical Properties, and Operations of the Air.*

1 Ancient opinions concerning the air.

§ 1. *The general conſtitution of the Air we breathe.*—For many ages this fluid was ſuppoſed to be ſimple and homogeneous; its common operations to depend on its heat, cold, moiſture, or dryneſs; and any effects which could not be explained by theſe (ſuch as the appearance of peſtilential diſeaſes), were reckoned to be entirely ſupernatural, and the immediate effects of Divine power. But, however ſimple and homogeneous this fluid may have been thought in former times, it is ſo far from poſſeſſing the ſimplicity of an element, that it is the receptacle of all kinds of effluvia produced from terreſtrial ſubſtances either naturally or artificially. Hence, whatever may be the nature of the aërial fluid when abſolutely pure, that which we breathe, and commonly goes under the name of *air,* muſt be conſidered as an exceedingly heterogeneous mixture, various at various times, and which it is by no means poſſible to analiſe with accuracy.

2 Common air a very heterogeneous fluid.

3 In what manner it purifies itſelf.

Though, in this view, air ſeems to be a kind of ſink or common ſewer, where all the poiſonous effluvia ariſing from putrid and corrupt matters are depoſited; yet it has a wonderful facility of purifying itſelf, and one way or other of depoſiting thoſe vapours contained in it; ſo that it never becomes noxious except in particular places, and for a ſhort time; the general maſs remaining upon all occaſions pretty much the ſame. The way in which this purification is effected is different, according to the nature of the vapour with which the air is loaded. That which moſt generally prevails is water; and from experiments it appears, that the quantity of aqueous vapour contained in the atmoſphere is immenſe. Dr Halley, from an experiment on the evaporation from a fluid ſurface heated to the ſame degree with that given by our meridian ſun, has calculated, that the evaporation from the Mediterranean ſea alone is ſufficient to yield all the water of the

4 Vaſt quantities of water continually diſcharged into it by evaporation.

the rivers which run into it. Dr Watſon, in his Chemical Eſſays, has given an account of ſome experiments made with a view to determine the quantity of the water raiſed from the earth itſelf in time of drought. He informs us, that, when there had been no rain for above a month, and the graſs was become quite brown and parched, the evaporation from an acre was not leſs than 1600 gallons in 24 hours. Making afterwards two experiments, when the ground had been wetted by a thunder-ſhower the day before, the one gave 1973, the other 1905, gallons in 12 hours. From this the air is every moment purified by the aſcent of the vapour, which flying off into the clouds, thus leaves room for the exhalation of freſh quantities: ſo that as the vapour is conſiderably lighter than the common atmoſphere, and of conſequence aſcends with great velocity, the air during all this time is ſaid to be *dry*, notwithſtanding the vaſt quantity of aqueous fluid that paſſes through it.

5 Different kinds of vapours which contaminate it.

Nor is it only from the aqueous vapour that the air is purified at this time. Much of that vapour ariſing from decayed and putrid animal and vegetable ſubſtances, and which by ſome modern philoſophers is called *phlogiſton*, attaches itſelf to the aqueous vapour, and aſcends along with it. Another part is abſorbed by vegetables: for the phlogiſtic vapour, as is ſhown under Agriculture, nº 5. is probably the food of plants. The phlogiſtic vapours which aſcend along with the water, probably continue there and deſcend along with the rain; whence the fertilizing qualities of rain-water above thoſe of any other. Thus we may ſee why a dry air, whether cold or hot, muſt always be wholeſome; but as the atmoſphere cannot always *receive* vapours, it is obvious, that when great rains come on, eſpecially if attended with heat, the lower regions of the air muſt be overloaded with vapours both of the aqueous and phlogiſtic kind, and of conſequence be very unwholeſome.

But beſides the aqueous and phlogiſtic vapours, both of which are ſpecifically lighter than common air, there are others, which, being ſpecifically heavier, cannot be carried off in this manner. Hence theſe groſs vapours contaminate certain places of the atmoſphere, rendering them not only unhealthy, but abſolutely poiſonous. Of theſe are, 1. Sulphureous, acid, and metalline exhalations. Theſe are produced principally by volcanoes; and as they deſcend, in conſequence of their ſpecific gravity, they ſuffocate and ſpread deſtruction all around them, poiſoning not only animals but vegetables alſo. 2. The vapours ariſing from houſes where lead and other metals are ſmelted, have the ſame pernicious qualities; inſomuch that the men who breathe them, the cattle who eat the graſs, and the fiſhes who inhabit the waters on which they fall, are poiſoned by them if taken into the body in a certain proportion. 3. Of the ſame kind are the *mofetes*, or emanations of fixed air, which ſometimes proceed from old lavas, or perhaps from ſome other places even of the ſurface. From all theſe the air ſeems not capable of purifying itſelf, otherwiſe than either by diſperſing them by winds, or by letting them ſubſide by their ſuperior gravity, till they are abſorbed either by the earth or water, according as it is their nature to unite with one or other of theſe elements. 4. Of this kind alſo ſeem to be the vapours which are called properly *peſtilential*. The contagion of the plague itſelf ſeems to be of an heavy ſluggiſh nature, incapable of ariſing in the air, but attaching itſelf to the walls of houſes, bed-cloaths, and wearing apparel. Hence ſcarce any conſtitution of the atmoſphere can diſpel theſe noxious effluvia; nor does it ſeem probable that peſtilential diſtempers ever ceaſe until the contagion has operated ſo long, and been ſo frequently communicated from one to another, that, like a ferment much expoſed to the atmoſphere, it becomes vapid, communicates a milder infection, and at laſt loſes its ſtrength altogether.

6 Specific gravity of the air.

§ 2. *Mechanical Properties of the* Air.—In common with water, the air we breathe poſſeſſes *gravity*, and conſequently will perform every thing in that way which water can do, making allowance for the great difference between the ſpecific gravity of water and of air. This difference indeed is exceedingly great, and has been variouſly calculated. Ricciolus eſtimates the gravity of air to be to that of water as 1 to 1000; Merſennus, as 1 to 1300, or 1 to 1356; Lana, as 1 to 640; and Galileo, only as 1 to 400. Mr Boyle, by more accurate experiments, makes the air at London to be to water as 1 to 938; and thinks, that, all things conſidered, the proportion of 1 to 1000 may be taken as a medium. But by three experiments made ſince that time before the Royal Society, the ſpecific gravity of the air was determined to be to that of water as 1 to 840, 852, and 860. By a very accurate experiment, Mr Haukſbee fixed the proportion as 1 to 885. But as all theſe experiments were made when the barometer was at 29½ inches, Dr Jurin ſuppoſes, that, at a medium between heat and cold, when the barometer is 30 inches high, the proportion between the two fluids may be taken as 1 to 800; and this agrees with the obſervations of the Hon. Mr Cavendiſh, made when the barometer was at 29½ inches, and the thermometer at 50.

7 Effects of the gravity of the air.

By means of its gravity, the air preſſes with great force upon all bodies, according to the extent of their ſurface. M. Paſcal has computed the quantity of this preſſure to be no leſs than 2232 pounds upon every ſquare foot of ſurface, or upwards of 15 pounds on every ſquare inch. According to ſome experiments made by M. Amontons and de la Hire, a column of air on the ſurface of the earth, and 36 fathoms high, is equal in weight to three lines depth of mercury. From the barometer, however, we know that the whole preſſure of the atmoſphere is very different; ſometimes being equal only to a column of 28 inches, and varying from thence to 31 inches. The whole quantity of preſſure muſt thus be immenſe, and has been computed equal to a globe of lead 60 miles in diameter.

By means of its gravity, the atmoſphere accompliſhes many uſeful purpoſes in nature. It prevents the arterial veſſels of animals and the ſap-veſſels of plants from being too much diſtended by the expanſive power (whatever it is), which has a perpetual tendency to ſwell them out. Thus we ſee, that, in the operation of cupping, where the preſſure of the air is taken off from a particular part, the expanſive force inſtantly acts, and ſwells out the veſſels to a great degree. Hence alſo, when animals are put into an air-pump, their whole bodies ſwell.

8
Elaſticity of the air.

By its gravity, the air promotes the union of fluid bodies, which would inſtantly ceaſe *in vacuo*. Thus oils and ſalts, which remain united in air, ſeparate as ſoon as that fluid is extracted. Hence alſo, when hot water is put under an exhauſted receiver, it boils violently: becauſe the preſſure of the air being now taken off, the particles of ſteam, which exiſted inviſibly among the water, and which the gravity of the atmoſphere prevented from flying off ſo ſoon, are now hurried up with great velocity, by means of the exceſſive comparative gravity of the aqueous fluid.

On the gravity of the air depend the aſcent of water in pumps, ſyphons, &c. and likewiſe all the phenomena of the barometer.

Beſides its gravity, which the air has in common with water and other fluids, there is another which it has only in common with ſteam or vapour. This is called its *elaſticity*; by which, like a ſpring, it allows itſelf to be compreſſed into a ſmaller bulk, and then returns again to its original ſize upon removing the preſſure.

The elaſticity of the air was firſt aſcertained by ſome experiments of lord Bacon, who, upon this principle, conſtructed the firſt thermometer, which he called his *vitrum calendare*. Of this power we have numerous proofs. Thus a blown bladder being ſqueezed in the hand, we find the included air ſenſibly reſiſt; ſo that, upon ceaſing to compreſs, the cavities or impreſſions made in its ſurface are readily expanded again and filled up.

The ſtructure and office of the *Air*-Pump depend on this elaſtic property. Every particle of air always exerts a niſus or endeavour to expand, and thus ſtrives againſt an equal endeavour of the ambient particles; whoſe reſiſtance happening by any means to be weakened, it immediately diffuſes itſelf into an immenſe extent. Hence it is that thin glaſs bubbles, or bladders filled with air, and exactly cloſed, being included in the exhauſted receiver of an air-pump, burſt by the force of the air they contain; and a bladder almoſt quite flaccid, ſwells in the receiver and appears full. The ſame effect alſo takes place, though in a ſmaller degree, on carrying the flaccid bladder to the top of an high mountain.

9
Whether this property can be diminiſhed.

It has been queſtioned among philoſophers, whether this elaſtic power of the air is capable of being deſtroyed or diminiſhed. Mr Boyle made ſeveral experiments with a view to diſcover how long air would retain its ſpring after having aſſumed the greateſt degree of expanſion his air-pump would give it; but he was never able to obſerve any ſenſible diminution. Deſaguliers found, that air, after having been incloſed for half a year in a wind-gun, had loſt none of its elaſticity; and Roberval, after preſerving it in the ſame manner for 16 years, obſerved that its expanſive projectile force was the ſame as if it had been recently condenſed. Nevertheleſs, Mr Haukſbee concludes, from a later experiment, that the ſpring of the air may be diſturbed by a violent preſſure, in ſuch a manner as to require ſome time to return to its natural tone. Dr Hales inferred, from a number of experiments, that the elaſticity of the air is capable of being impaired and diminiſhed by a variety of cauſes.

The weight or preſſure of the air has no dependence on its elaſticity; but would be the ſame whether it had ſuch a property or not. The air, however, being elaſtic, is neceſſarily affected by the preſſure, which reduces it into ſuch a ſpace, that the elaſticity, which reacts againſt the compreſſing weight, is equal to that weight. In effect, the law of this elaſticity is, that it increaſes as the denſity of the air increaſes; and the denſity increaſes as the force increaſes by which it is preſſed. Now there muſt neceſſarily be a balance between the action and re-action; i. e. the gravity of the air which tends to compreſs it, and the elaſticity by which it endeavours to expand, muſt be equal. Hence the elaſticity increaſing, or diminiſhing univerſally, as the denſity increaſes or diminiſhes, it is no matter whether the air be compreſſed and retained in ſuch a ſpace by the weight of the atmoſphere, or by any other means; it muſt endeavour in either caſe to expand with the ſame force. And hence, if air near the earth be pent up in a veſſel, and all communication with the external fluid cut off, the preſſure of the incloſed air will be equal to the weight of the atmoſphere at the time the quantity was confined. Accordingly, we find mercury ſuſtained to the ſame height, by the elaſtic force of air incloſed in a glaſs veſſel, as by the whole atmoſpherical preſſure. On the ſame principle air may be artificially condenſed; and hence the ſtructure of the Air-*Gun*.

10
Utmoſt limits of its condenſation and expanſion.

The utmoſt limits to which air, of the denſity which it poſſeſſes at the ſurface of the earth, is capable of being compreſſed, have not been aſcertained. Mr Boyle made it 13 times more denſe; Dr Halley ſays that he has ſeen it compreſſed ſo as to be 60 times denſer than in its natural ſtate, which is farther confirmed by M. Papin and M. Huygens. Dr Hales, by means of a preſs condenſed it 38 times; and by forcing water in an iron ball or globe, into 1551 times leſs ſpace than it naturally occupies. However Dr Halley has aſſerted, in the Philoſophical Tranſactions, Abr. vol. ii. p. 17. that from the experiments made at London, and by the academy del Cimento at Florence, it might be ſafely concluded, that no force whatever is able to reduce air into 800 times leſs ſpace than that which it naturally poſſeſſes on the ſurface of our earth. In anſwer to this, M. Amontons, in the Memoirs of the French Academy, maintains, that there is no fixing any bounds to its condenſation; that greater and greater weights will ſtill reduce it into leſs and leſs compaſs; that it is only elaſtic in virtue of the fire which it contains; and that as it is impoſſible ever to drive all the fire out of it, it is impoſſible ever to make the utmoſt condenſation.

The dilatation of the air, by virtue of its elaſtic force, is found to be very ſurpriſing; and yet Dr Wallis ſuggeſts, that we are far from knowing the utmoſt of which it is capable. In ſeveral experiments made by Mr Boyle, it dilated firſt into nine times its former ſpace; then into 31 times; then into 60; then into 150. Afterwards it was brought to dilate into 8000 times its ſpace, then into 10,000, and even at laſt into 13,679 times its ſpace; and this altogether by its own expanſive force, without the help of fire. On this depend the ſtructure and uſe of the Manometer.

Hence it appears, that the air we breathe near the ſurface of the earth is compreſſed by its own weight into at leaſt the 13,679th part of the ſpace it would poſſeſs *in vacuo*. But if the ſame air be condenſed by art,

art, the ſpace it will take up when moſt dilated, to that it poſſeſſes when condenſed, will be, according to the ſame author's experiments, as 550,000 to 1.

11 Expanſion of the air by heat.

M. Amontons, and others, we have already obſerved, attribute the rarefaction of the air wholly to the fire contained in it; and therefore, by increaſing the degree of heat, the degree of rarefaction may be carried ſtill further than in ſpontaneous dilatation. Air is expanded one-third of its bulk by boiling water.

Dr Hales found, that the air in a retort, when the bottom of the veſſel was juſt beginning to be red-hot, was expanded through twice its former ſpace; and in a white, or almoſt melting heat, it occupied thrice its former ſpace; but Mr Robins found it was expanded by the heat of iron, juſt beginning to be white, to four times its former bulk. On this principle depend the ſtructure and office of the THERMOMETER.

M. Amontons firſt diſcovered that air will expand in proportion to its denſity with the ſame degree of heat. On this foundation the ingenious author has a diſcourſe, to prove "that the ſpring and weight of the air, with a moderate degree of warmth, may enable it to produce even earthquakes, and other of the moſt vehement commotions of nature." See the article EARTHQUAKE.

12 General effects of the air's elaſticity.

The elaſtic power of the air, then, is the ſecond great ſource of the effects of this important fluid. Thus it inſinuates into the pores of bodies; and, by poſſeſſing this prodigious faculty of expanding, which is ſo eaſily excited, it muſt neceſſarily put the particles of bodies into which it inſinuates itſelf into perpetual oſcillations. Indeed, the degree of heat, and the air's gravity and denſity, and conſequently its elaſticity and expanſion, never remaining the ſame for the leaſt ſpace of time, there muſt be an inceſſant vibration or dilatation and contraction in all bodies.

We obſerve this reciprocation in ſeveral inſtances, particularly in plants, the air-veſſels of which do the office of lungs; for the contained air alternately expanding and contracting, according to the increaſe or diminution of the heat, alternately preſſes the veſſels and eaſes them again, thus keeping up a perpetual motion in their juices.

Hence we find, that no vegetation or germination will proceed *in vacuo*. Indeed, beans have been obſerved to grow a little tumid therein; and this has led ſome to attribute that to vegetation which was really owing to no other cauſe than the dilatation of the air within them. The air is very inſtrumental in the production and growth of vegetables, not only by invigorating their ſeveral juices while in an elaſtic active ſtate, but alſo by greatly contributing in a fixed ſtate to the union and firm connection of their ſeveral conſtituent parts.

From the ſame cauſe it is, that the air contained in bubbles of ice, by its continual action burſts the ice. Thus alſo, entire columns of marble ſometimes cleave in the winter time, from the increaſed elaſticity of ſome little bubble of air contained in them. From the ſame principle ariſe all putrefaction and fermentation; neither of which will proceed, even in the beſt diſpoſed ſubjects, *in vacuo*.

Since we find ſuch great quantities of elaſtic air generated in the ſolution of animal and vegetable ſubſtances, a good deal muſt conſtantly ariſe from the diſſolution of theſe aliments in the ſtomach and bowels, which is much promoted by it; and, in reality, all natural corruption and alteration ſeem to depend on air.

§ 3. *Effects of the different Ingredients of Air.*—This fluid acts not only by its common properties of gravity and elaſticity, but produces numerous other effects ariſing from the peculiar ingredients of which it conſiſts.

13 Solvent power of the air on metals.

Thus, 1. It not only diſſolves and attenuates bodies by its preſſure and attrition, but as a chaos containing all kinds of menſtrua, and conſequently poſſeſſing powers for diſſolving all bodies. It is known that iron and copper readily diſſolve and become ruſty in air, unleſs well defended with oil. Boerhaave aſſures us, that he has ſeen pillars of iron ſo reduced by air, that they might be crumbled to duſt between the fingers; and as for copper, it is converted by the air into a ſubſtance much like the verdigris produced by vinegar.

Mr Boyle relates, that in the ſouthern Engliſh colonies, the great guns ruſt ſo faſt, that after lying in the air for a few years, large cakes of crocus martis may be ſeparated from them. Acoſta adds, that in Peru the air diſſolves lead, and conſiderably increaſes its weight. Yet gold is generally eſteemed indiſſoluble by air, being never found to contract ruſt, though expoſed to it ever ſo long. In the laboratories of chemiſts, however, where aqua regia is prepared, the air becoming impregnated with a quantity of the vapour of this menſtruum, gold contracts a ruſt like other bodies.

14 On ſtones.

Stones alſo undergo the changes incident to metals. Thus Purbeck ſtone, of which Saliſbury cathedral conſiſts, is obſerved gradually to become ſofter, and to moulder away in the air; and Mr Boyle gives the ſame account of Blackington ſtone. He adds, that air may have a conſiderable operation on vitriol, even when a ſtrong fire could act no farther upon it. And he has found, that the fumes of a corroſive liquor work more ſuddenly and manifeſtly on a certain metal when ſuſtained in the air, than the menſtruum itſelf did, which emitted fumes on thoſe parts of the metal which it covered; referring to the effects of the effluvia of vinegar on copper.

The diſſolving power of air is increaſed by heat, and by other cauſes. It combines with water; and by acceſs of cold, depoſits part of the matter which was kept diſſolved in it by a greater degree of heat. Hence the water, by being depoſited and condenſed upon any cold body, ſuch as glaſs, &c. in windows, forms fogs, and becomes viſible.

15 Various chemical effects of the air.

In the various operations of chemiſtry, air is a very neceſſary and important agent; the reſult of particular proceſſes depending on its preſence or abſence, on its being open or incloſed. Thus, the parts of animals and vegetables can only be calcined in open air; in cloſe veſſels they never become any other than black coals. And theſe operations are affected by the changes to which the air is liable. Many inſtances might be adduced to this purpoſe. Let it ſuffice to obſerve, that it is very difficult to procure oil of ſulphur, *per campanam*, in a clear dry atmoſphere; but in a thick moiſt air it may be obtained with greater eaſe, and in larger quantities. So, pure well-fermented wine, if it be carried to a place where the air is repleniſhed with the fumes of new wine then fermenting, will begin to ferment afreſh.

The changes in the air ariſe from various cauſes, and are obſervable, not only in its mechanical properties, ſuch as gravity, denſity, &c. but in the ingredients that compoſe it. Thus, at Faſhlun in Sweden, noted for copper-mines, the mineral exhalations affect the air in ſuch a manner as to diſcolour ſilver coin in purſes; and the ſame effluvia change the colour of braſs. In Carniola, Campania, &c. where are mines of ſulphur, the air becomes ſometimes very unwholeſome, which occaſions frequent epidemic diſeaſes, &c.

The effluvia of animals alſo have their effect in varying the air; as is evident in contagious diſeaſes, plagues, murrains, and other mortalities, which are ſpread by an infected air.

For the vivifying principle of air, ſee the article *Blood*.

Sect. II. *Hiſtorical Account of the principal Diſcoveries concerning the Compoſition of Atmoſpherical Air and other Aërial Fluids.*

16 Van Helmont the firſt diſcoverer of different kinds of air.

While the preceding diſcoveries were making concerning the mechanical and other properties of the air, little notice ſeems to have been taken of the elementary parts of the air itſelf, or the different kinds of fluid which go under that name. It was known, indeed, that air was ſeparable from terreſtrial bodies by means of fire, fermentation, &c. but this was commonly reckoned to be the ſame with what we breathe. Van Helmont, a diſciple of Paracelſus, was the firſt who undertook to make enquiries concerning this ſpecies of air. He gave it the name of *gas ſylveſtre*, from the Dutch word *ghoaſt*, ſignifying ſpirit; and obſerves, that ſome bodies reſolve themſelves almoſt entirely into it. "Not (ſays he) that it had been actually contained in that form in the bodies from which it was ſeparated; but it was contained under a concrete form, as if fixed, or coagulated." According to this author, the gas ſylveſtre is the ſame with what is ſeparated from all ſubſtances by fermentation; from vegetables by the action of fire; from gun-powder when it explodes; and from charcoal when burning. On this occaſion he aſſerts, that 62 pound of charcoal contain 61 pounds of gas and only one pound of earth. To the effluvium of gas he alſo attributes the fatal effects of the grotto Del Cani in Italy, and the ſuffocation of workmen in mines. He aſſerts, that it is to the corruption of the aliment, and the gas diſcharged from it, that we are to attribute wind, and the diſcharges of it from the bowels. Upon the ſame principles he accounts for the ſwelling of dead bodies which have remained for a time under water, and for the tumours which ariſe on ſome parts of the body in certain diſeaſes. He alſo determines, that this gas is different from the air we breathe; that it has a greater affinity with water: and he imagined it might conſiſt of water reduced to vapours, or a very ſubtile acid combined with volatile alkali.

17 Diſcoveries by Mr Boyle.

Mr Boyle repeated all Van Helmont's experiments to more advantage than he himſelf had performed them; but ſeems not to have proceeded further in his diſcoveries than Van Helmont did: only he found ſome bodies, ſuch as ſulphur, amber, camphor, &c. diminiſh the volume of air in which they burn.

18 By Dr Hales

19 Suſpicion of air in mineral waters.

20 Confirmed by Mr Venel.

Dr Hales firſt attempted to determine the quantity of air produced from different bodies; for which purpoſe he made experiments on almoſt every known ſubſtance in nature, examining them by diſtillation, fermentation, combuſtion, combinations, &c. He alſo firſt ſuſpected, that the briſkneſs and ſparkling of the waters called *acidulous*, were owing to the air they contained. But notwithſtanding all his diſcoveries concerning the quantity of elaſtic fluid obtained from different bodies, he did not imagine there was any eſſential difference between this fluid and the air we breathe; only that the former was loaded with noxious vapours, foreign to its nature. His ſuſpicion concerning this impregnation was confirmed by M. Venel, profeſſor of chemiſtry at Montpelier, in a memoir read before the Royal Academy of Sciences in 1750. This gentleman was able to diſengage the air from the Seltzer waters, and to meaſure its quantity; which he conſtantly found to amount to about one-fifth of its bulk. The water thus deprived of its air became flat, and ceaſed to ſparkle; the only difference then betwixt it and common water was, that the former contained a ſmall quantity of ſea-ſalt. Upon theſe principles he attempted to recompoſe Seltzer water, by diſſolving in a pint of common water two drachms of foſſile alkali, and then adding an equal quantity of marine acid. The quantity of ſea-ſalt produced by the union of theſe two, he knew would prove equal to that contained in a pint of Seltzer water; and the effervescence produced by the action of the acid and alkali upon each other, he imagined, would produce air ſufficient for the impregnation of the water. In this he was not deceived; the water thus produced was not only analogous to Seltzer, but much more ſtrongly impregnated with air.

21 Diſcoveries by Dr Black, &c.

Dr Black firſt diſcovered, that chalk, and the other earths reducible to quicklime by calcination, conſiſt of an alkaline earth, by itſelf ſoluble in water, but which, combined with a large quantity of fixed air, becomes inſoluble; loſing the properties of quicklime, and aſſuming the natural appearance we obſerve thoſe earths to have when not reduced into lime. The ſame thing he diſcovered in magneſia alba, and in alkalis both fixed and volatile. On the fixed air contained in theſe bodies, he found not only their property of effervſcing with acids to depend, but likewiſe their mildneſs; both the alkalis and calcareous earth being highly cauſtic when deprived of the fixed air. He alſo found, that this fluid, which he called *fixed air*, had different degrees of affinity with different ſubſtances; that it was ſtronger with calcareous earth than with fixed alkali; with fixed alkali, than magneſia; and with magneſia, than volatile alkali. He alſo ſuſpected, that the fixed air of alkaline ſalts unites itſelf with the precipitates of metals, when thrown down from acids; and that the increaſe of weight obſervable in theſe precipitates was owing to this cauſe. But he was of opinion, that the fluid which he called *fixed air* was very different from the common air we breathe; and therefore adopted the name of air, merely as one already eſtabliſhed, whatever impropriety there might be in the term.

It was not long before the diſcovery of this ſpecies of air ſuggeſted new theories in phyſiology and natural philoſophy. Mr Haller had inferred, from Dr Hales's experiments, that air is the real cement of bodies; which, fixing itſelf in the ſolids and fluids, unites them to each other, and ſerves as a bond by which they are kept from diſſolution. In 1764, Dr Macbride of Dublin publiſhed a number of experiments in ſupport of this doctrine. From his work it appears, that fixed air is ſeparated, not only from all ſubſtances in fermentation, but alſo from all animal ſubſtances as they begin to putrify; and that this air is capable of uniting itſelf to all calcareous earths, as well as alkalis both fixed and volatile, and reſtoring to them the property of effervescing with acids when they have by any means been deprived of it. But though theſe opinions have ſince been found erroneous, the concluſions drawn by him from his numerous experiments ſtill hold good, viz. that fixed air is an elaſtic fluid, very different from the common air we breathe: that it is poſſeſſed of a ſtrong antiſeptic quality, and may be introduced with ſafety into the inteſtinal canal, and other parts of the animal œconomy, where common air would have fatal effects; but is mortal if breathed into the lungs, &c.

22
Quantity of fixed air contained in alkaline ſalts determined by Mr Cavendiſh.

In 1766 and 1767, Mr Cavendiſh communicated ſome new experiments to the Royal Society at London, wherein he determines the quantity of air contained in fixed alkali, when fully ſaturated with it, to be five-twelfths of its weight, and ſeven-twelfths in volatile alkali: that water is capable of abſorbing more than its own bulk of this air; that it has then an agreeable, ſpirituous, and acidulous taſte; and that it has the property of diſſolving calcareous earths and magneſia, as well as almoſt all the metals, eſpecially iron and zinc: that the vapour of burning charcoal occaſions a remarkable diminution of common air, at the ſame time that a conſiderable quantity of fixed air is produced in the operation. He alſo found, that ſolution of copper in ſpirit of ſalt, inſtead of producing inflammable air, like that of iron or zinc, afforded a ſpecies of air which loſt its elaſticity as ſoon as it came into contact with water.

23
Conteſt concerning the doctrine of fixed air.

The diſcoveries of Dr Black concerning fixed air, had not been long publiſhed, when they were violently attacked by ſome foreign chemiſts, while his cauſe was as eagerly eſpouſed by others. The principal opponents were Mr Meyer apothecary at Oſnabruck, Mr Crans phyſician to his Ruſſian Majeſty, and Mr de Smeth at Utrecht. Their arguments, however, were effectually anſwered at the time by Mr Jacquin, botanical profeſſor at Vienna; and the numerous diſcoveries made ſince that time have given ſuch additional confirmation to his doctrine, that it is now univerſally adopted by chemiſts both in Britain and other countries.

24
Compoſition of the atmoſphere diſcovered.

It was reſerved, however, for Dr Prieſtley to make the great diſcovery concerning the nature of our atmoſphere; and to inform the world, that it is compoſed of two fluids; the one abſolutely noxious, and incapable of ſupporting animal life for a moment; the other extremely ſalutary, and capable of preſerving animals alive and healthy for a much longer time than the pureſt air we can meet with. This may be conſidered as the ultimate period of our hiſtory: for ſince that time the diſcoveries of philoſophers ſtill living, in many different countries, have been ſo rapid, that it is difficult to aſcertain the dates of them by any authentic documents; eſpecially as, by reaſon of ſuch numerous experiments, the ſame things have not unfrequently been diſcovered by different perſons unknown to each other. We ſhall therefore proceed to give an account of the different kinds of ærial fluids, beginning with thoſe which are known, or ſuppoſed, to conſtitute a part of our atmoſphere.

Sect. III. *Of Dephlogiſticated Air.*

§ 1. *Diſcovery and Methods of procuring this Kind of Air.*—Dephlogiſticated air was firſt obtained by Dr Prieſtley on the 1ſt of Auguſt 1774. The circumſtances which led him to the diſcovery, were his having always procured inflammable air from ſpirit of ſalt, by adding to it ſpirit of wine, oil of olives, oil of turpentine, charcoal, phoſphorus, bees wax, and even ſulphur.

25
Whence firſt extracted.

Hence he ſuſpected, that the common air we breathe might be compoſed of ſome kind of acid united with phlogiſton. On this ſuppoſition he extracted air from mercurius calcinatus *per ſe*, by expoſing it to the focus of a burning-glaſs 12 inches in diameter; and, having repeated the experiment with red precipitate and minium, he found, that though a quantity of fixed air was always produced, yet after that was ſeparated, the remainder ſupported flame much more vigorouſly than common air; for a candle burned in it with a flame very much enlarged, and with a crackling noiſe, at the ſame time that it appeared fully as much diminiſhed by the teſt of nitrous air. Whence he concluded, that it was reſpirable; and, on making the experiment, found that it actually was ſo, for a mouſe lived a full half hour in a quantity of this fluid; which, had it been common air, would only have kept it alive half that time. Nor did the animal ſeem to be otherwiſe injured than by the cold; as it preſently revived on bringing it near the fire, and the remainder of the air ſtill appeared better than that of the atmoſphere, when the teſt of nitrous air was applied to it.

26
Why named dephlogiſticated.

The pure kind of air being diſcovered, the Doctor next proceeded to name it *dephlogiſticated*, from his opinion that common air, in the act of burning, abſorbed phlogiſton; of conſequence, he ſuppoſed, that which abſorbed the moſt, or which moſt vigorouſly and for the greateſt length of time ſupported flame, was ſuppoſed to contain the ſmalleſt quantity of this ſubſtance.

27
Produced from a great variety of ſubſtances.

In the courſe of his inquiries why this kind of air comes to be ſo much dephlogiſticated, he fell upon a method of extracting it from a great variety of ſubſtances; viz. by moiſtening them with ſpirit of nitre, and then diſtilling them with a ſtrong heat. Thus he obtained it from flowers of zinc, chalk, quicklime, ſlacked lime, tobacco-pipe clay, flint, Muſcovy talcs, and even glaſs. He then found, that by ſimply diſſolving any metal in the nitrous acid, and then diſtilling the ſolution, he could obtain very pure air: and Mr Warltire found even the trouble of diſtillation unneceſſary; nothing more being requiſite than to moiſten red lead with the ſpirit of nitre, and then pour upon it the oil of vitriol, which inſtantly diſengaged the dephlogiſticated air without applying any more heat than what was generated by the mixture.

28
This kind of air diſcovered alſo by Mr Scheele.

While diſcoveries of this kind engaged Dr Prieſtley in England, Mr Scheele was employed in a ſimilar manner in Sweden; and had actually obtained the ſame kind of air, without knowing any thing of what Dr Prieſtley had done. The latter had the merit of the

prior

Dephlogiſticated Air.

prior diſcovery: but Mr Scheele's method was more ſimple, conſiſting only in the diſtillation of nitre with a ſtrong heat; by which means it is now found that dephlogiſticated air may be obtained in very conſiderable quantity, and in as great purity, as by the more expenſive proceſſes. The pure air from nitre had indeed partly been obtained by Dr Hales long before this time; ſince he informs us, that half a cubic inch of nitre yielded 90 cubic inches of air, which was undoubtedly the fluid we ſpeak of; but as he neglected to proſecute the diſcovery, nothing farther was known at that time.

29
May be produced without nitrous acid.

As the nitrous acid was univerſally concerned in the firſt proceſſes for obtaining this kind of air, it was for ſome time generally believed to be a peculiar property of that acid alone to produce it; but the indefatigable genius of Dr Prieſtley ſoon found, that it might not only be procured where no nitrous acid was employed, but where the ſubſtances were treated with vitriolic acid. It was indeed evident, from the very firſt experiment, that nitrous acid was not eſſentially neceſſary; ſince pure air was procured from precipitate *per ſe*, in the preparation of which no nitrous acid is employed. The Abbé Fontana found, that 192 grains of this ſubſtance yielded $65\frac{1}{2}$ cubic inches of dephlogiſticated air, at the ſame that time the weight of it was reduced to $788\frac{8}{9}$ grains, which is nearly the weight of that quantity of air. It had formerly been obſerved, that the weight of mercury is augmented during its converſion into precipitate *per ſe*, as that of lead is by its converſion into minium. The experiments juſt now mentioned, therefore, ſhow, that during this proceſs the air is decompounded; the pure dephlogiſticated part of it being abſorbed by the metal, and appearing again on the application of heat; and the ſame appears to be the caſe with red lead, from the experiment of Mr Warltire already mentioned. With regard to this laſt ſubſtance, however, a very great ſingularity is obſerved; viz. that when newly prepared it yields none at all, and even for ſome time after the produce is much ſmaller than when it has been long kept. The reaſon of this ſeems to be, that the minium ſtill contains a conſiderable quantity of phlogiſton, which flies off into the atmoſphere by long keeping, a larger quantity of the dephlogiſticated part of the atmoſphere being imbibed at the ſame time. The mode of applying heat has alſo a very conſiderable effect on the quantity of air produced. Thus, Dr Prieſtley remarks,* that "from equal quantities of red lead, without any mixture of ſpirit of nitre, and uſing the ſame apparatus for diſtilling it, he obtained, by means of heat applied ſuddenly, more air than when ſlowly applied, in the proportion of ten to ſix. The proportion of fixed air was the ſame in both caſes, and the remainder equally dephlogiſticated."

30
Produced in greateſt quantities by a quick and violent heat.

31
Method of extracting it from various ſubſtances.

By heat alone, the Doctor found, that ſedative ſalt, mangane ſe, lapis calaminaris, and the mineral called *lapis ponderoſus, wolfram,* or *tungſten,* would yield dephlogiſticated air; the firſt indeed in very ſmall quantity, and ſometimes even of a quality very little ſuperior to common air. In theſe experiments, he made uſe of ſmall-bellied retorts of green glaſs, which can ſtand the fire beſt, containing about an ounce of water, and having narrow necks 18 or 20 inches long. The ſubſtance to be examined was put into a retort of this kind, and then expoſed to a red heat, either in ſand or over a naked fire, while the neck of the veſſel was plunged in water or mercury.

Having diſſolved ſix pennyweights of very clean iron in oil of vitriol, and then diſtilled the ſolution to dryneſs in a long-necked retort, he received the common air a little phlogiſticated, ſome fixed air, much vitriolic acid air, and laſtly 18 ounce meaſures of dephlogiſticated air. The iron that remained undiſſolved weighed 23 grains, ſo that the air was yielded by five pennyweights one grain of iron. The ochre weighed ſeven pennyweights thirteen grains: ſo that, ſays he, there probably remained a quantity of oil of vitriol in it; and conſequently, had the heat been greater, more air would have been obtained.

In his experiments with the nitrous acid, as it had conſtantly been found, that by pouring on more nitrous acid on the reſiduum, and repeating the operation, more dephlogiſticated air might be obtained, the Doctor determined to try whether the ſame would not hold good with vitriolic acid alſo. For this purpoſe, he added more oil of vitriol to the reſiduum of the laſt-mentioned experiment. When in a red heat with a glaſs retort, it yielded a quantity of vitriolic acid air, no fixed air, but about 24 ounce meaſures of dephlogiſticated air; when, the retort being melted, a good deal of the air was neceſſarily loſt; but, on reſuming the proceſs in a gun-barrel, he procured as much air as had been got before.—Purſuing theſe experiments, he obtained with common cruſt of iron and oil of vitriol, dephlogiſticated air at the firſt diſtillation, and a great deal more from the reſiduum, by pouring freſh oil of vitriol upon it. The ſame product he obtained from blue vitriol, ſolution of copper in the vitriolic acid, and from a ſolution of mercury in that acid. On this ſubſtance he remarks, that "either by means of oil of vitriol or ſpirit of nitre, it yields a great quantity of dephlogiſticated air: but with this difference, that in the proceſs with ſpirit of nitre, almoſt the whole of the mercury is revived (not more than a twentieth part being loſt, if the proceſs be conducted with care); but in that with vitriolic acid, almoſt the whole is loſt." From the later experiments of Mr Lavoiſier, however, it appears that the Doctor's proceſs had not been conducted with ſufficient care; as from two ounces of the dry ſalt formed by a combination of vitriolic acid with mercury, the former obtained 6 drachms 12 grains of running mercury, beſides 3 drachms 58 grains of mercurial ſublimate of two different colours. Dephlogiſticated air was likewiſe obtained from pure calx of tin, or putty, mixed with oil of vitriol; but none in any trial with the marine acid, excepting when it was mixed with minium; in which caſe the air obtained was probably that which the minium would have yielded without any addition.

The reſult of all theſe, and innumerable other experiments made by philoſophers in different countries, was, that dephlogiſticated air may be obtained from a vaſt variety of mineral and metallic ſubſtances by means of the vitriolic and nitrous acids. It now remained only to diſcover in what manner this fluid, ſo eſſentially neceſſary to the ſupport of animal life, is naturally produced in quantities ſufficient for the great expence of it throughout the whole world, by the breathing of animals, the ſupport of fires, &c. This diſcovery, indeed,

32
How dephlogiſticated air is naturally produced.

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* Exper. and Obſerv. iii. 27.

deed, had been made before even the exiſtence of dephlogiſticated air itſelf was known. Dr Prieſtley, after having tried various methods of purifying contaminated air unſucceſsfully, found at laſt, that ſome kinds of vegetables anſwered this purpoſe very effectually; for which diſcovery he received the thanks of the Royal Society. Among the vegetables employed on this occaſion, he found mint anſwer the purpoſe very effectually. "When air," ſays he *, "has been freſhly and ſtrongly tainted with putrefaction, ſo as to ſmell through the water, ſprigs of mint have preſently died upon being put into it, their leaves turning black; but if they do not die preſently, they thrive in a moſt ſurpriſing manner. In no other circumſtances have I ſeen vegetation ſo vigorous as in this kind of air, which is immediately fatal to animal life. Though theſe plants have been crowded in jars filled with this kind of air, every leaf has been full of life; freſh ſhoots have branched out in various directions, and grown much faſter than other ſimilar plants growing in the ſame expoſure in common air."

33
Noxious air improved by vegetating mint.

—Having in conſequence of this obſervation rendered a quantity of air thoroughly noxious, by mice breathing and dying in it, he divided it into two receivers inverted in water, introducing a ſprig of mint into one of them, and keeping the other receiver unaltered. About eight or nine days after, he found that the air of the receiver into which he had introduced the ſprig had become reſpirable; for a mouſe lived very well in this, whereas it died the moment it was put into the other.

34
Experiments ſeemingly contradictory.

From theſe experiments the Doctor at firſt concluded, that in all caſes the air was meliorated by the vegetation of plants: but even in his firſt volume he obſerves, that ſome experiments of this kind did not anſwer ſo well towards the end of the year as they had done in the hot ſeaſon; and a ſecond courſe ſeemed to be almoſt entirely contrary to the former. Having tried the power of ſeveral ſorts of vegetables upon air infected by reſpiration or by the burning of candles, he found that it was generally rendered worſe by their vegetation; and the longer the plants were kept in the infected air, the more they phlogiſticated it; though in ſeveral caſes it was undoubted meliorated, eſpecially by the ſhoots of ſtrawberries and ſome other plants, introduced into the vials containing foul air, and inverted in water, which were placed near them, whilſt their roots continued in the earth in the garden. Sometimes the infected air was ſo far mended by the vegetation of plants that it was in a great meaſure turned into dephlogiſticated air. "On the whole,*" ſays Dr Prieſtley, "I ſtill think it probable, that the vegetation of healthy plants, growing in ſituations natural to them, have a ſalutary effect on the air in which they grow.—For one inſtance of the melioration of air in theſe circumſtances ſhould weigh againſt an hundred in which the air is made worſe by it, both on account of the diſadvantages under which all plants labour, in the circumſtances in which theſe experiments muſt be made, as well as the great attention and many precautions that are requiſite in conducting ſuch a proceſs."

35
Experiments of Dr Ingenhouſz on the melioration of air by vegetation.

At the time that Dr Prieſtley made theſe experiments, he ſuppoſed that the air was meliorated merely by the abſorption of phlogiſton from that which had been tainted; but the experiments of Dr Ingenhouſz, made in 1779, ſhowed that this was accompliſhed, not only by the abſorption juſt mentioned, but by the emiſſion of dephlogiſticated air. He obſerved in general, that plants have a power of correcting bad air, and even of improving common air in a few hours, when expoſed to the light of the ſun; but, in the night-time, or when they are not influenced by the ſolar rays, they contaminate the air. This property, however, does not belong in an equal degree to all kinds of plants: nor is it poſſible to diſcover by the external properties of a plant, whether it be fit for this purpoſe or not; as ſome which have a bad ſmell, and are entirely unfit for food, ſhow themſelves much ſuperior to others whoſe external appearance would ſeem preferable. His method of making the experiment was, to fill a vial with air, fouled either by reſpiration or combuſtion; after which a ſprig of any plant was introduced, by paſſing it through the water in which the vial was immerſed. The vial was then ſtopped; or it was removed into a ſmall baſon full of water, and expoſed to the ſun, or ſituated in ſome other proper place as occaſion required. Air phlogiſticated by breathing, and in which a candle could not burn, after being expoſed to the ſun for three hours, with a ſprig of peppermint in it, was ſo far corrected, as to be again capable of ſupporting flame. The following experiment, however, made with a muſtard plant, may be looked upon as deciſive: A plant of this kind was put into a glaſs receiver containing common air, and its ſtem cut off even with the mouth of the receiver. The veſſel was then inverted in an earthen pan, containing ſome water to keep the plant alive, and the whole apparatus was ſet over-night in a room. Next morning the air was found ſo much contaminated, that it extinguiſhed the flame of a wax taper. On expoſing the apparatus to the ſun for a quarter of an hour, the air was found to be ſomewhat corrected; and after an hour and a half it was ſo far improved, that by the teſt of nitrous air it appeared conſiderably better than common air.

36
Dephlogiſticated air produced from water.

Before we proceed farther in the account of Dr Ingenhouſz's experiments, it will be neceſſary to relate ſome obſervations made by Dr Prieſtley; from which it appears, that dephlogiſticated air, in very conſiderable quantity, may, in certain circumſtances, be procured from water alone. The ſubſtance of theſe is, that water, eſpecially pump-water, when expoſed to the light of the ſun, emits air ſlowly: but after ſome time a green matter appears on the bottom and ſides of the glaſs; after which it emits very pure air in great quantity, and continues to do ſo for a very long time, even after the green matter has ſhown ſome ſymptoms of decay by becoming yellow. He obſerved, that the water which naturally contained the greateſt quantity of fixed air, yielded alſo the greateſt quantity of that which was dephlogiſticated; but that the quantity of the latter much exceeded that of the fixed air contained even in any water. The light of the ſun was found to be an eſſential requiſite in the formation of this air, as very little, and that of a much worſe quality, was produced in the dark.

As the green matter produced in Dr Prieſtley's glaſſes, was by himſelf, as well as others, conſidered as belonging to the vegetable kingdom, Dr Ingenhouſz improved upon his proceſs, by putting the leaves of plants into water, and expoſing them to the ſun. All plants were not equally fit for producing dephlogiſticated air

37
From the leaves of plants.

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* Exper. and Obſerv. vol. i. p. 1. ſect. 4.

* Exper. and Obſerv. iv. 302.

by this method more than by the other. Some poiſonous plants, as the hyoſcyamus, lauro-ceraſus, night-ſhade, the tobacco-plant, a triplex vulvaria, cicuta aquatica, and ſabina, were found very fit for the purpoſe; but the pureſt kind of air was extracted from ſome aquatic vegetables, the turpentine-trees, and eſpecially from the green matter he collected in a ſtone trough which was kept continually filled with water from a ſpring near the high-road. The purity of this dephlogiſticated air, he ſays, was equal, if not ſuperior, to that procured by the beſt chemical proceſſes; as it ſometimes required eight times its own quantity of nitrous air to ſaturate it. All parts of the plants were not found equally proper for the production of dephlogiſticated air; the full grown leaves yielded it in greateſt quantity and purity, eſpecially from their under ſurface. It was alſo procured from the green ſtalks.—One hundred leaves of *Naſturtium Indicum*, put into a jar holding a gallon, filled with ordinary pump-water, and expoſed to the ſun from 10 to 12 o'clock, yielded as much air as filled a cylindrical jar four inches and an half in length, and one and three quarters in breadth. On removing this quantity of air, and expoſing them again to the ſun till ſeven o'clock, about half as much was produced, of a quality ſtill ſuperior to the former; and next morning by eleven o'clock, they yielded as much more of an equal quality. The roots of plants, he ſays, when kept out of ground, generally yield bad air, and at all times contaminate common air, a few only excepted. Flowers aud fruits, in general, yield a very ſmall quantity of noxious air, aud contaminate a great quantity of common air at all times, eſpecially in the night, and when kept in the dark. Two dozen of young and ſmall French beans, kept in a quart-jar of common air for a ſingle night, contaminated the air to ſuch a degree, that a very lively chicken died by being confined in it leſs than half a minute.

38
Concluſions from Dr Ingenhouſz's experiments.

The obſervations of Dr Ingenhouſz on the whole, ſays Mr Cavallo, clearly ſhow, "that the vegetation of plants is one of the great means employed by nature to purify the atmoſphere, ſo as to counteract, in great meaſure, the damage done by animal reſpiration, combuſtion, &c. It may only be ſaid, that vegetation does not appear to be ſufficient to remedy entirely that damage." The Doctor himſelf, however, ſpeaks very highly of the powers of vegetables in this reſpect. He informs us, that their office in yielding dephlogiſticated air begins a few hours after the ſun has made his appearance in the horizon, or rather after it has paſſed the meridian, and ceaſes with the cloſe of day; excepting ſome plants which continue it a ſhort time after ſun-ſet: The quantity of dephlogiſticated air, yielded by plants in general, is greater in a clear day than when it is ſomewhat cloudy. It is alſo greater when the plants are more expoſed to the ſun, than when they are ſituated in ſhady places. He obſerves, moreover, that the damage done by plants in the night, is more than counterbalanced by the benefit they afford in the day-time. "By a rough calculation (ſays he), I found the poiſonous air, yielded by any plant during the whole night, could not amount to one hundredth part of the dephlogiſticated air which the ſame plant yielded in two hours time in a fair day."—It does not appear, however, that plants yield dephlogiſticated air by any kind of generation of that fluid, but only by filtrating the common air, which all plants abſorb through their pores; the phlogiſtic part becoming part of their ſubſtance, and probably being the true vegetable food, as is explained more at large under the article AGRICULTURE.—Dry plants have little or no effect upon the air until they are moiſtened—On all theſe experiments, however, it muſt be obſerved, that they have ſometimes failed in the hands of thoſe whom we cannot but ſuppoſe very capable of trying them; as Mr Scheele, Mr Cavallo, and the Abbé Fontana.

39
Sir Benjamin Thompſon's experiments.

After the publication of Dr Ingenhouſz's experiments, it became generally believed, that the atmoſphere was meliorated by the common proceſs of vegetation, and that plants abſorbed the phlogiſtic part as their food, diſcharging the pure dephlogiſticated air as an excrement; which is juſt the reverſe of what happens to animals, who abſorb the pure part in reſpiration, and reject the phlogiſtic. In the Philoſophical Tranſactions for 1787, however, we find a number of experiments related by Sir Benjamin Thompſon, which ſeem to render this matter dubious.—One very conſiderable objection is, that the green matter, already mentioned in Dr Prieſtley's experiments, when carefully obſerved by a good microſcope, appears not to be of a vegetable, but of an animal nature. The colouring matter of the water, ſays he, is evidently of an animal nature; being nothing more than the aſſemblage of an infinite number of very ſmall, active, oval-formed animalcules, without any thing reſembling *tremella*, or that kind of green matter or water-moſs which forms upon the bottom and ſides of the veſſel when this water is ſuffered to remain on it for a conſiderable time, and into which Dr Ingenhouſz ſuppoſes the animalcules above mentioned to be actually transformed.

40
Green matter obſerved by Dr Prieſtley, ſaid to be of an animal nature.

This gentleman has alſo found, that ſeveral animal ſubſtances, as well as vegetables, have a power of ſeparating dephlogiſticated air from water when expoſed to the light of the ſun, and that for a very great length of time. Not that the ſame quantity of water will always continue to furniſh air; but the ſame animal ſubſtance being taken out, waſhed and again put into freſh water, ſeems to yield dephlogiſticated air, without any kind of limitation.

41
Dephlogiſticated air produced by raw ſilk.

Raw ſilk poſſeſſes a remarkable power of this kind. To determine it, Sir Benjamin introduced 30 grains of this ſubſtance, previouſly waſhed in water, into a thin glaſs globe 4½ inches in diameter, having a cylindrical neck ¾ths of an inch wide, and twelve inches long, inverting the globe into a jar filled with the ſame kind of water, and expoſing it to the action of the ſun in the window. It had not been ten minutes in this ſituation, when the ſilk became covered with an infinite number of air-bubbles, gradually increaſing in ſize, till, at the end of two hours, the ſilk was buoyed up, by their means, to the top of the water. By degrees they began to ſeparate themſelves, and form a collection of air in the upper part of the globe; which, when examined by the teſt of nitrous air, appeared to be very pure. In three days he had collected 3¾ cubic inches of air; into which a wax-taper being introduced, that had juſt before been blown out, the wick only remaining red, it inſtantly took fire, and burned with a bright and enlarged flame. The water in the globe appeared to have loſt ſomething of its tranſparency, and had changed its colour to a very faint greeniſh caſt, having at the ſame time acquired the ſmell of raw ſilk.—This was ſeveral times repeated with freſh water, retaining the ſame ſilk, and always with a ſmaller reſult; but with this difference, that when the ſun ſhone very bright, the quantity of air produced was not only greater, but its quality ſuperior to that yielded when the ſun's rays were feeble, or when they were frequently intercepted by flying clouds. "The air, however, (ſays he), was always not only much better than common air, but even than that produced by the freſh leaves of plants expoſed in water to the ſun's rays in the experiments of Dr Ingenhouſz; and, under the moſt favourable circumſtances, it was ſo good, that one meaſure of it required four of nitrous air to ſaturate it, and the whole five meaſures were reduced to 1.35."

42
No air produced in the dark.

An experiment was next made in order to determine the effect of darkneſs upon the production of air: and in this caſe only a few inconſiderable bubbles were formed, which remained attached to the ſilk; nor was the caſe altered by removing the globe into a German ſtove. Some ſingle bubbles, indeed, had detached themſelves from the ſilk and aſcended to the top, but the air was in too little quantity to be meaſured or proved.—The medium heat of the globle, when expoſed to the ſun's rays, was about 90° of Fahrenheit, though ſometimes it would riſe as high as 96; but air was frequently produced, when the heat did not exceed 65 and 70°.—On reverſing this experiment, in order to try the effect of light without heat, it was found, that by plunging the globe into a mixture of ice and water, which brought it to the temperature of about 50° of Fahrenheit, the produce of air was diminiſhed, though it ſtill continued in conſiderable quantity.

43
Effects of light without heat.

44
Of artificial light.

The effect of artificial light, inſtead of that of the ſun, was next tried. For this purpoſe all the air was removed from the globe; and its place being ſupplied with a quantity of freſh water, ſo as to render it quite full, it was again inverted in the jar, and removed into a dark room ſurrounded with ſix lamps and reflectors; ſix wax candles were alſo placed at different diſtances from three to ſix inches from it, and diſpoſed in ſuch a manner as to throw the greateſt quantity of light poſſible upon the ſilk, taking care at the ſame time that the water ſhould not acquire a greater heat than 90°. In this ſituation the ſilk began to be covered with air-bubbles in about ten minutes; and in ſix hours as much was collected as could be proved by nitrous air, when it was found to be very pure. A freſh-gathered, healthy leaf of a peach tree, and a ſtem of the pea-plant with three leaves upon it, furniſhed air by expoſure to the ſame light, but in ſmaller quantities than by the action of the ſolar rays. The air produced in the dark, in whatever manner procured, was always in too ſmall a quantity to be meaſured.

In making theſe experiments, as it was found ſomewhat troubleſome to invert the globes in water, they were at laſt only kept in an inclined poſture on the table, as repreſented in Plate X. fig. 1. the air collecting itſelf in the upper part of the belly. Having provided himſelf with a number of globes of different ſizes, he then proceeded in his experiments in the following manner.

45
Various ſubſtances ſubſtituted for raw ſilk.

Finding that raw ſilk, expoſed to the action of light, produced ſo great a quantity of air, he was induced to try whether ſome other ſubſtances might not be found out capable of doing the ſame. Having therefore provided ſix globes of 4½ inches in diameter, and filled them with ſpring water, he introduced into each of them 15 grains of one of the following ſubſtances, *viz.* ſheep's wool, eider-down, fur of a Ruſſian hare, cotton wool, lint or the ravelings of linen yarn, and human hair.—The reſults of theſe experiments were, 1. The globe containing the ſheep's wool began to yield air in three days; but ſeveral days of cloudy weather intervening, he did not remove it for ſome time, when only 1¾ths of an inch of air was collected, which proved very pure when tried with nitrous air; bnt the wool, even in the moſt favourable circumſtances, never afforded more than one third of the quantity which would have been yielded by ſilk. 2. The water with the eider-down began to furniſh air almoſt immediately, and continued to do ſo in quantities little leſs than had been furniſhed by the ſilk, and nearly the ſame quality. One cubic inch and three quarters of this air, furniſhed the eighth day from the beginning of the experiment, with three meaſures of nitrous air, was reduced to 1.34. 3. The fur of the hare produced more air than the wool, but leſs than the eider-down. Two cubic inches of air were collected in four days; which made its appearance in a different manner from that of the other ſubſtances, the air-bubbles being at conſiderable diſtances from one another, and growing to an uncommon ſize before they detached themſelves from the fur. The cotton yielded a conſiderable quantity of air of a better quality than any of the former. The ravelings of linen were very ſlow in furniſhing air, and produced but a ſmall quantity; only two cubic inches being collected in the ſpace of a fortnight. This ſubſtance appeared to be the very reverſe of the hare's fur; for the air, inſtead of attaching and collecting itſelf about the ſubſtance in large bubbles, ſcarce ever made its appearance in ſufficient quantity to raiſe it to the top of the water. The human hair furniſhed ſtill leſs than the linen, and the produce was of inferior quality, though ſtill ſuperior to the common atmoſphere.

In order to diſcover the comparative fineneſs of air produced from vegetables and from raw ſilk, a ſmall quantity of air from the ſtem of a pea-plant, which had four healthy leaves upon it, was proved with nitrous air, and found greatly inferior to that from raw ſilk and ſeveral of the ſubſtances already mentioned. An entire plant of houſewort, of a moderate ſize, furniſhed only ¾ths of a cubic inch of air in ſeven hours, and that greatly inferior to common air; but the leaves alone afforded a much greater quantity, and of a quality greatly ſuperior.

46
Of the quantity of air procured by means of theſe ſubſtances from water.

Having proceeded thus far, it was next determined to aſcertain how much air a given quantity of water would yield by expoſure to the ſun's rays. For this purpoſe, a globe of fine white, clear, and very thin glaſs, containing 296 inches, being filled with freſh ſpring water, and 30 grains of raw ſilk immerſed in it, was expoſed to the air for three days in the month of May, but for the moſt part cold and cloudy. During this time only 9½ inches of air were produced; but next day, by expoſure to the ſun from nine in the morning till five in the afternoon, the weather being very fine, 8.46 inches more were produced. The water had now aſſumed a light greeniſh colour. Next day, the product of air was nine cubic inches, of a better quality; and the day following, ſix inches ſtill ſuperior, though expoſed only for three hours and an half; but the next day, it being cold and cloudy, only ¾ths of an inch of air were produced, and theſe manifeſtly inferior to the foregoing. No more air could afterwards be procured, excepting one quarter of a cubic inch; ſo that from 296 inches of this water, 33.96 of air were obtained.

In this experiment the air produced was every day removed from the globe, and its place ſupplied with water: the following were made, to determine what alteration would take place on allowing the quantity of air produced to remain from firſt to laſt. The globe being therefore filled again, and the ſilk well waſhed and replaced in it, the quantity of air produced amounted in four days to 30.1 cubic inches; and would probably have been more conſiderable, had not the globe been unable to contain it along with the water, and therefore there was a neceſſity for putting an end to the experiment. The quality was ſuperior to the former.—In this experiment the water had loſt its tranſparency, and acquired a greeniſh caſt; a quantity of yellowiſh earth was precipitated to the bottom, and attached itſelf ſo ſtrongly to the glaſs, that it could not be removed without great difficulty.

On varying the experiment, by employing unwaſhed raw ſilk, it was found, that 17 grains of it in 20 cubic inches of water, produced, for the firſt four days, air of a worſe quality than the atmoſphere; but afterwards yielded near two inches of a ſuperior quality. The quantity of this air was ſuperior to that in other experiments, though its quality was ſomewhat ſuperior.

In reflecting on the experiments above related, it occurred to Sir Benjamin, that the cotton-like ſubſtance produced by the *populus nigra*, a ſpecies of poplar tree, might be a proper ſubſtitute for the raw ſilk; eſpecially as he recollected, that on rendering it very dry for ſome other purpoſe, ſome parcels of it had quitted the plate on which they were laid, and mounted up to the top of the room. An hundred and twenty grains of this ſubſtance were therefore put into the large globe containing 296 inches; but after expoſure to the ſun for ſome hours, the air produced, in quantity about 1¾ths of a cubic inch, was found to be little better than phlogiſticatod air. In three days after, only one cubic inch was formed; and this appeared to be completely phlogiſticated. Next day, only a few inconſiderable air-bubbles appeared; but, the day following, the water ſuddenly changed to a greeniſh colour, and began all at once to give good air, and in great abundance. This day 10.42 cubic inches were produced, and the next 14.34. The ſame water continued to furniſh air for four days longer; the whole quantity amounting to 44¼ cubic inches, the quality of which was ſuperior to that of the air produced in former experiments.

47 Of the cauſe of this production of air.

In ſpeculating on the cauſe of this production of air, it occurred to our author, that perhaps the quantity of it might be in proportion to the ſurfaces of both. In order to aſcertain this, he viewed an hair of ſilk, and another of poplar-cotton, through a good microſcope, when the former appeared twice the diameter of the latter. The ſpecific gravity of the cotton was found to be nearly equivalent to that of water; and, by a comparative view of the two through a microſcope, the ſurfaces appeared to be as 1000 to 3468. By proceeding in this calculation, it appeared that the ſurface of 30 grains of the cotton could not be leſs than 6600 ſquare inches, while that of a like quantity of the ſilk amounted to no more than 476. Hence it evidently appeared, that the produce of air from the two ſubſtances was neither in proportion to their weights nor their ſurfaces. It appeared alſo, that the quality of the air produced at firſt was conſiderably inferior to that yielded ſome time afterwards. In order to aſcertain the times at which air of the beſt quality was produced, &c. the following experiments were made: 1. A globe, containing 46 cubic inches, being filled with water, and 30 grains of raw ſilk, well waſhed, and freed from the remains of former experiments, put into it, yielded in a cold and cloudy day only ¼th of a cubic inch of air: the two following days it yielded 3½ cubic inches, the quality of which was ſuperior to that of the former in the proportion of 296 to 114 (A). 2. The globe being filled again with water, in two other days when the ſunſhine was leſs powerful, the quality was 197, and the quantity 1⅛; but afterwards, when the weather became fine, the quantity was again 3.8 inches, and quality 342. 3. The globe being again filled with water, and expoſed to the ſun for two days, yielded 2.2 inches of air, of a quality equal to 233. 4. A ſimilar globe, with poplar-cotton which had been uſed in former experiments, gave 2.53 inches, of a quality 280. 5. A ſmall globe of 20 inches, with 17 grains of raw ſilk, gave one cubic inch of air, of the quality 263. 6. A large globe of 296 inches, filled with freſh water, and a ſmall quantity of *conferva rivularis*, gave 1½ cubic inch, of the quality only of 124. The water was changed to a brown colour. 7. On repeating the cxperiment with a ſmall handful of the conferva, 13.14 cubic inches of air were produced, of the quality 146. The water was very faintly tinged, towards the end of the experiment, of a greeniſh caſt. 8. The globe of 46 inches, with 30 grains of raw ſilk uſed in many former experiments, produced in two days 1.6 cubic inches of air, of the quality 204. 9. A globe of equal capacity, with 15 grains of poplar-cotton, produced in the ſame time 1.28 inches, of the quality 260. In both theſe experiments, the water had acquired a faint greeniſh caſt; but the colour of that with the cotton was deepeſt. On examining this water with a microſcope, it was found to contain a great number of animalcules exceedingly ſmall, and nearly of an oval figure; that with the ſilk contained them likewiſe, but not in ſuch numbers: however, our author aſſures us, that in all caſes in which the water acquired a greeniſh hue, he never failed to find them; and thinks, that from their preſence alone, the colour of the water in the firſt inſtance univerſally aroſe.

48 At what times air of the beſt quality is produced.

49 Experiment with ſpun glaſs.

As Sir Benjamin was now more than ever embarraſſed with reſpect to the ſhare the ſilk and other bodies employed in theſe experiments had in producing the air, he made the following experiment to determine the matter: "Concluding (ſays he), that if ſilk and other bodies,

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(A) In all theſe experiments, the quality of the atmoſpheric air is ſuppoſed to be 100.

bodies, uſed in the foregoing experiments, actually did not contribute any thing, conſidered as chemical ſubſtances, in the proceſs of the production of pure air yielded by water; but if, on the contrary, they acted merely as a mechanical aid in its *ſeparation* from the water, by affording a convenient ſurface for the air to attach itſelf to; in this caſe, any other body having a large ſurface, and attracting air in water, might be made uſe of inſtead of the ſilk in the experiment, and pure air would be furniſhed, though the body ſhould be totally incapable of communicating any thing whatever to the water."

With a view to aſcertain this, the large globe being made perfectly clean, and filled with ſpring-water, he introduced into it a quantity of the fine thread of glaſs commonly called *ſpun-glaſs*, ſuch as is uſed for making a bruſh for cleaning jewels, and an artificial feather ſold by Jew pedlars. The reſult of the experiment was, that the globe being expoſed to the ſun, air-bubbles began almoſt inſtantly to make their appearance on the ſurface, and in four hours 0.77 of a cubic inch of air was procured, which, with nitrous air, ſhowed a quality of 88; after which, not a ſingle globule more was produced, though the globe was expoſed for a whole week in fine ſunſhine weather. Hence it appears, that ſomething more than mere ſurface was wanted to produce dephlogiſticated air from water by means of the ſun's light.

50 Of the quantity and quality of air produced from water alone.

The following experiments were made with a view to determine the quantity and quality of air produced by means of the heat and light of the ſun from water alone. A large jar of clear glaſs, containing 455 cubic inches, being waſhed very clean, was filled with freſh ſpring water, inverted in a glaſs baſon of the ſame, and expoſed to the weather for 28 days. At the ſame time, another ſimilar jar was filled with water taken from a pond in a garden in which many aquatic plants were growing, and expoſed in the ſame place, and during the ſame period. The latter began to yield air in pretty large quantities on the third day, and continued to do ſo till the 14th; the former yielded little or none till the 14th, when it began to emit air, and continued to do ſo till the 22d. On removing the air produced, that from the ſpring-water was 14 inches in quantity, and 138 in quality; but from the pond-water, 31½ in quantity, and 252 in quality. The colour of the waters was not changed; but both of them had depoſited a conſiderable quantity of earth, which was found adhering to the ſurfaces of the glaſs baſons in which the jars were inverted. As theſe baſons, however, were very thick, and conſequently had but little tranſparency, the ſediment of the water was in a great meaſure deprived of the benefit of the ſun's light; the experiment was therefore repeated with the following variation: In a large cylindrical jar of very fine tranſparent glaſs, 10 inches in diameter and 12 inches high, filled with ſpring-water, a conical jar, 9¾ inches in diameter at the bottom, and containing 244 inches, was inverted, and the whole expoſed to the ſun for 21 days. Little air was furniſhed till the 7th day, when the liquor aſſumed a greeniſh caſt, and a fine ſlimy ſediment of the ſame colour, the green matter of Dr Prieſtley beginning to be formed on the bottom, air was generated in abundance, and was furniſhed in pretty large quantities till the 18th, when it entirely ceaſed. The whole amounted to 40 cubic inches, and the quality 213.

51 Dr Ingenhouſz's theory conteſted.

Theſe are the principal experiments contained in Sir Benjamin Thompſon's letter to Sir Joſeph Banks. In his poſtſcript he obſerves, that as he never was thoroughly ſatisfied with the opinion of Dr Ingenhouſz, that the dephlogiſticated air was *elaborated* in the veſſels of the plant, he found his doubts rather confirmed than diminiſhed by the experiments above related. "That the freſh leaves of certain vegetables (ſays he), expoſed in water to the action of the ſun's rays, cauſe a certain quantity of pure air to be produced, is a fact which has been put beyond all doubt: but it does not appear to me by any means ſo clearly proved, that this air is '*elaborated* in the plant by the powers of vegetation,—phlogiſticated or fixed air being received by the plant as food, and the dephlogiſticated air rejected as an excrement:' for beſides that many other ſubſtances, and in which no elaboration or circulation can poſſibly be ſuppoſed to take place, cauſe the water in which they are expoſed to the action of the light to yield dephlogiſticated air as well as plants, and even in much greater quantities, and of a more eminent quality; the circumſtances of the leaves of a vegetable, which, accuſtomed to grow in air, are ſeparated from its ſtem and confined in water, are ſo unnatural, that I cannot conceive that they can perform the ſame functions in ſuch different ſituations.

"Among many facts which have been brought in ſupport of the received opinion of the elaboration of air in the veſſels of plants, there is one upon which great ſtreſs is laid, which, I think, requires further examination. The freſh healthy leaves of vegetables, ſeparated from the plant, and expoſed in water to the action of the ſun's rays, appear by all the experiments which have hitherto been made, to furniſh air only for a ſhort time. After a day or two, the leaves, changing colour, ceaſe to yield air. This has been conceived to ariſe from the powers of vegetation being deſtroyed, or, in other words, the death of the plant: and from hence it has been inferred, with ſome degree of plauſibility, not only that the leaves actually retained their vegetative powers for ſome time after they were ſeparated from their ſtock; but that it was in conſequence of the exertion of thoſe powers, that the air yielded in the experiment was produced.

52 Leaves of plants reſume their property of emitting air, after ſeeming to have loſt it.

"But I have found, that though the leaves, expoſed in water to the action of light, actually do ceaſe to furniſh air after a certain time, yet that they *regain* this power after a ſhort interval, when they furniſh (or rather cauſe the water to furniſh) more and better air than at firſt; which can hardly be accounted for upon the ſuppoſition that the air is elaborated in the veſſels of the plant."

In confirmation of this doctrine, the globe of 46 inches was filled with freſh ſpring-water, and two peach-leaves were expoſed for 10 days to the ſun. In four days the water ſeemed to be entirely exhauſted; but, next day, the water acquired a greeniſh colour, and again produced air pretty plentifully, which appeared in bubbles on the leaves; and on the 6th day, 0.34 of a cubic inch of air was produced, of the quality 232. Next day it yielded $\frac{9}{10}$ of a cubic inch, of the quality 297. The three ſucceeding days it yielded 1¾ inches, the quality 307; after which an end was put to the experiment.—

riment.—On making other trials with leaves immerſed in water already green and prepared to yield dephlogiſticated air, it was found that they produced air in great quantity: but our author is of opinion, that all the appearances may be ſolved, by ſuppoſing that the air was produced in the maſs of water by the green matter; and that the leaves, ſilk, &c. did no more than aſſiſt it in making its eſcape, by affording a convenient ſurface to which it could attach itſelf, in order to collect together and aſſume its elaſtic form.

53 Pure air found in ſea-water.

Thus we ſee, that nature is provided with abundant reſources for the ſupplying of this pure part of the atmoſphere which is ſubject to ſuch continual waſte; and there is not the leaſt doubt, that in a great number of caſes the light of the ſun produces pure air from water as well as from vegetables. It is probable, alſo, that even the waters of the ocean contribute towards this ſalutary purpoſe; as Dr Dobſon of Liverpool found that ſea-water contained air ſuperior in quality to that of the atmoſphere. The purification of atmoſpherical air by agitating it in water, will be conſidered in a ſubſequent ſection.

54 How to procure pure air in large quantity.

As dephlogiſticated air is found to ſupport animal life for a much longer time than common air, it has been ſuppoſed that it might anſwer valuable purpoſes, in medicine, provided any cheap method of procuring it in large quantities could be fallen upon. With this view, Mr Cavallo propoſes to diſtil it from nitre with a ſtrong heat; but the experiments already related certainly point out an eaſier method, free from the expence and trouble which muſt neceſſarily attend every chemical operation of this kind.

§ 2. *Properties of Dephlogiſticated Air.*—This kind of air poſſeſſes ſome of the properties of common air in a very eminent degree, but is deficient in others. Thoſe in which it excels, are the ſupport of flame and of animal life. It is equally elaſtic, or rather more ſo, than common air; as it likewiſe exceeds it a little in ſpecific gravity, the proportion betwixt it and common air being that of 160 to 152. On introducing a lighted candle into dephlogiſticated air, the flame not only grows larger, but becomes exceedingly bright; and when the air is very pure, the candle burns with a crackling noiſe, as if the air contained ſome combuſtible matter, at the ſame time that the wax or tallow waſtes ſurpriſingly faſt.

55 Dephlogiſticated air produces intenſe heat.

The heat of the flame is in proportion to its light. If we fill a bladder with dephlogiſticated air, and then faſten to its neck a glaſs tube whoſe aperture is drawn to a fine point, the dephlogiſticated air, if driven out by preſſing the bladder, will augment the heat of a candle to ſuch a degree, that if any ſmall bits of metal, placed on a piece of charcoal, be held in the apex of the flame, they will be almoſt inſtantly melted. Even grains of platina may by this means be melted; and in a larger fire there is no doubt that the effects of burning mirrors might be equalled.

56 Explodes violently with inflammable air.

On mixing dephlogiſticated and inflammable air together, an exploſion takes place as on mixing common and inflammable air, but with much greater violence. If an ounce vial, which for this purpoſe ſhould be very ſtrong, be filled with a little more than one-third of dephlogiſticated and the reſt inflammable air, and the flame of a candle preſented to its mouth, it will explode nearly as loud as a ſmall piſtol.

57 Burns vehemently with pyrophorus.

All phlogiſtic proceſſes are promoted much better by dephlogiſticated than common air. Dr Prieſtley put a quantity of pyrophorus into one of the ſmall jars uſed for making experiments upon air in quickſilver; then filling up the veſſel with that fluid, he inverted it in a baſon of the ſame, and threw in dephlogiſticated air at different times. It always occaſioned a ſudden and vehement accenſion, like the flaſhing of gun-powder, and the air was greatly diminiſhed.

58 Common air is not diminiſhed by burning.

59 But dephlogiſticated air ſuffers diminution.

It has been, almoſt throughout all ages, believed, that combuſtion in every inſtance diminiſhed common air, or reduced it to a ſmaller volume: but the late experiments of Mr Lavoiſier have ſhown, that this is a miſtake; and that in ordinary proceſſes attended with the production of fixed and phlogiſticated air, the quantity of vapour produced is equivalent to that abſorbed, or otherwiſe made to diſappear during the operation. With dephlogiſticated air the caſe is very different. Mr Lavoiſier having introduced a burning candle into a glaſs jar filled with very pure air obtained from calcined mercury, a great heat took place; which at firſt expelled a ſmall quantity of the air; but afterwards, when the candle was extinguiſhed, it was found that two-thirds of the bulk of air employed had been converted into fixed air, or a quantity of this kind of air equivalent to the former had been produced. The remainder, after taking up the fixed air by cauſtic alkali, was ſtill as pure as before. In the common proceſſes, he obſerves, that not more than one-tenth of the air employed is converted into fixed air. In this experiment, the ſuperior gravity of fixed air, and the conſequent condenſation of the other, muſt undoubtedly have produced ſome diminution in the volume of air, though Mr Lavoiſier does not take notice of it. In other caſes, however, the diminution is much more perceptible. Mr Scheele having introduced ſome live coals into a matraſs filled with dephlogiſticated air, found that it was diminiſhed by one-fourth of its quantity. Repeating the experiment with ſulphur, the flame became larger and more vivid than in common air, and three-fourths of its quantity were loſt. Putting a piece of phoſphorus into ſeven ounce-meaſures of this kind of air, ſtopping the mouth of the bottle with a cork, and ſetting fire to the phoſphorus within it, the vial broke in pieces, as ſoon as the flame was extinguiſhed, by the preſſure of the external air. Repeating the experiment with a ſtronger vial, and opening it afterwards under water, the fluid ruſhed into it in ſuch a manner as almoſt to fill it entirely. This extraordinary diminution was alſo perceived on ſetting fire to inflammable air in the dephlogiſticated kind. The way in which he accompliſhed this was, by filling a matraſs with dephlogiſticated air and inverting it over a phial containing an efferveſcing mixture of vitriolic acid and iron-filings plunged into a veſſel of hot water, and furniſhed with a ſlender tube reaching above the ſurface of the veſſel, as repreſented Plate X. fig. 2. The inflammable air iſſuing from the orifice of the ſmall tube, was ſet on fire previous to the inverſion of the matraſs, and the mouth of the latter immerſed in the water; on which that fluid ſoon began to riſe, and continued to do ſo till ſeven-eighths of the veſſel were full. In caſes of ſlow combuſtion, where common air is diminiſhed and dephlogiſticated, the phlogiſticated kind was found to be almoſt entirely deſtroyed. A phial, containing 20 ounce meaſures of dephlogiſticated air, and inverted into a ſolution of hepar ſulphuris, was entirely filled with the latter in the ſpace of two days.

60
Phenomena of dephlogiſticated with nitrous air.

The purity of dephlogiſticated air is aſcertained by its degree of diminution with nitrous air; which, like that of the diminution by liver of ſulphur, or otherwiſe, is to be conſidered as a phlogiſtic proceſs, or kind of burning, eſpecially as a conſiderable degree of heat is thereby generated. Very great differences are perceived in this reſpect; and according to the quantity of diminution, the air is ſaid to be two, three, or four times better than common air. It is not yet accurately determined how far this proportionable purity extends. Dr Prieſtley mentions ſome extracted from red lead five times as pure as common air. Another quantity, produced from a ſolution of mercury in nitrous acid, was ſo pure, that one meaſure of it mixed with two of nitrous air, which had been obtained in the firſt part of the ſame proceſs, occupied only 0.03 of a meaſure. "Repeating the experiment (ſays he), I found, that two meaſures of nitrous air were rather more than ſufficient to ſaturate one meaſure of the dephlogiſticated air; ſo that poſſibly, had the former experiment been made with more circumſpection, the diminution, extraordinary as it was, would have been ſomewhat greater. Indeed, it cannot be ſuppoſed, that exactly two meaſures of nitrous air ſhould be the preciſe quantity that would afford the greateſt diminution. It ſhould alſo be conſidered, that a ſmall portion of air might be yielded by the water in which the experiments were made. Upon the whole, therefore, I am inclined to think, that, were it poſſible to make both the dephlogiſticated and nitrous air in the greateſt purity, and then to mix them in ſome exact proportion, the aërial form of them both would be deſtroyed, the whole quantity ſeeming to diſappear, as in the mixture of alkaline and acid air."

61
How dephlogiſticated air may be contaminated.

Notwithſtanding this great degree of purity, the beſt dephlogiſticated air is capable of being contaminated by ſome of the proceſſes which affect the common air of our atmoſphere. Dr Prieſtley having introduced a quantity of very dry, clean nails, into a receiver filled with dephlogiſticated air, and inverted it in quickſilver, found, that, about nine months after, one-tenth of the whole quantity had diſappeared, tho' he could not perceive any ruſt upon the nails. The effects of combuſtion have already been related, viz. as producing a great quantity of pure fixed air; but putrefaction and animal reſpiration probably contaminate it in a manner ſimilar to that of atmoſpherical air, though few or no experiments ſeem to have been made on this ſubject. Mr Cavallo, however, informs us, that "when an animal is confined in a quantity of dephlogiſticated air, and is kept therein till it dies, that air is not rendered ſo bad, but that it will ſtill be capable of conſiderable diminution by nitrous air. This ſeems to ſhow, that dephlogiſticated air is ſomewhat different from pure common air; or that common air is originally different from dephlogiſticated air, lowered by the addition of phlogiſton. The phenomenon is certainly very remarkable; and ſometimes a quantity of dephlogiſticated air, after having been breathed by an animal till it died, will appear by the nitrous teſt to be even better than common air. When the experiment is performed over lime-water (to abſorb the fixed air produced in reſpiration), the diminution by a mixture of nitrous air is leſs than it would otherwiſe be; but it is ſtill diminiſhed much more than common air after an animal has died in it; which ſeems to intimate, that the death of the animal in dephlogiſticated air is principally owing to the fixed air formed by the act of reſpiration. It may be ſaid, that the inflammable principle diſcharged through the lungs of an animal, being perhaps combined with ſome other principle, requires a longer time to combine with the dephlogiſticated air than the phlogiſton of nitrous air; but this is only an hypothetical explanation of the abovementioned remarkable phenomenon, which requires many direct proofs."

62
Vegetation ill ſupported by dephlogiſticated air.

Dephlogiſticated air is much inferior to that of the common atmoſphere in ſupporting vegetable life. This has been aſcertained by the experiments of Dr Prieſtley, Mr Fontana, Mr Scheele, Dr Ingenhouſz, &c. Dr Prieſtley took three ſprigs of mint, and having put all the roots into vials containing the ſame pump-water which had been for ſome time expoſed to the atmoſphere, introduced one of them into a jar of dephlogiſticated air, another into a jar of common air, and a third into that which had been phlogiſticated with nitrous air ſeveral months before, and in ſuch a ſtate, that one meaſure of it, and one of nitrous air, occupied the ſpace of 1¾ meaſures. This was done in April; and on examining them on the 12th of May following, it was found, that the plant in phlogiſticated air had grown remarkably, much better than that in common air; while the plant in dephlogiſticated air had a very ſickly appearance. Examining them on the 26th of the ſame month, the appearance continued nearly as before; but it was now found, that though the plant in phlogiſticated air had grown ſo well, the air was not ſenſibly improved by it, though the dephlogiſticated air was injured by the plant which grew in it.

63
Dr Prieſtley's firſt hypotheſis.

§ 3. *Of the Compoſition of Dephlogiſticated Air.*—When Dr Prieſtley firſt diſcovered the exiſtence of this fluid, having found that it was always procured by means of earthy ſubſtances; and that as it came over, the bubbles appeared full of white fine powder; he concluded, that it is compoſed of the nitrous acid and earth, with as much phlogiſton as is neceſſary to its elaſticity; and that the common atmoſphere has as much more as is neceſſary to bring it into the mean condition in which we find it. It was not long, however, before this theory met with oppoſition. Dr Prieſtley himſelf, though induced, from the waſte of the ſolid matter uſed in his experiments, to conclude that the air contained ſome quantity of earth, was nevertheleſs unable, by any method he could think of, to aſcertain that quantity. His experiments were oppoſed by others made by Lavoiſier; who inſiſted, that when ſolution of mercury was carefully diſtilled, the metal was obtained in full quantity, or with ſcarce any loſs, notwithſtanding the dephlogiſticated air produced. This gentleman having put two ounces and one drachm of mercury into red precipitate, and afterwards revived it, loſt a very few grains of the metal: which, he ſays, might be the weight of a little red matter that was found adhering to the neck of the veſſel. The ſame thing was obſerved by Mr Fontana, who repeated the experiment often with leſs than a grain

64
Difference betwixt Dr Prieſtley, Mr Lavoiſier, &c.

grain weight of loſs. The veſſel he uſed had a neck of about two feet long: and he particularly remarks, that, in order to ſucceed in this experiment, the fire ſhould be managed with very great dexterity: for if that be too ſtrong, part of the precipitate will be volatilized, and then the reſult of the experiment is precarious.

Theſe experiments were oppoſed by others made by Dr Prieſtley, who in ſeveral trials found that a conſiderable quantity of the metal was always loſt. In one of theſe experiments, out of 11 pennyweights 10 grains of mercury, the loſs amounted to one pennyweight two grains. In another experiment, 88 grains were loſt, out of a quantity of red precipitate, in the preparation of which half an ounce of mercury had been employed. The quantity of mercury loſt in his experiments, or rather the proportion of it to that of the metal employed, was always various, and the difference not very ſmall; whence Mr Cavallo and others, with great appearance of reaſon, conclude, that the true reaſon of any perceptible loſs was the ſtrong heat made uſe of in the diſtillation, and conſequently that there is no reaſon to ſuppoſe that any earth exiſts in dephlogiſticated air.

65
Earth cannot be proved to exiſt in dephlogiſticated air.

66
Whether the nitrous acid enters its compoſition.

The next queſtion was, Whether any of the nitrous acid exiſted in dephlogiſticated air? That it contains none in a proper ſtate of acidity, is indeed evident from many deciſive experiments; but an idea was naturally entertained, that in the formation of dephlogiſticated air the nitrous acid was decompoſed, and part of it entered into the compoſition of the aërial fluid. This gave riſe to the theories of Mr Lavoiſier and Mr Kirwan, which are noticed under the article Acid; as alſo the experiments of Mr Watt, which tended to ſhow that no nitrous acid was deſtroyed in the compoſition of dephlogiſticated air. To theſe Mr Kirwan replied in the manner related in that article. We ſhall here, however, give a quotation from Dr Prieſtley as a kind of addition to Mr Watt's teſtimony on this head, ſo that the reader may be the better able to determine the weight of the evidence on both ſides.

"At Mr Watt's requeſt (ſays he), I endeavoured to aſcertain the quantity of acid that was expelled from nitre, in procuring the dephlogiſticated air from it. To do this, I put two ounces of purified nitre into a glaſs retort, and receiving the air in 300 ounce meaſures of water, only filled each recipient half full, and agitated the air very much in the water in order to make the fluid imbibe as much as poſſible of the acid it contained. Notwithſtanding this agitation, however, every veſſel of the air retained a ſtrong ſmell of the acid. The moment the air ceaſed to come, I filled a large phial with the water, and carried it to Mr Watt, who carefully examined it; and in a paper which he preſented to the Royal Society, and which is publiſhed in the Philoſophical Tranſactions, he has given an account of the quantity of acid that was contained in all the 300 ounces of water; whence it may be fairly inferred, that there was no occaſion to ſuppoſe that any of the acid entered into the compoſition of the air; but that it was all either rendered volatile or retained in the water." On the other hand, the Abbé Fontana informs us, that, in diſtilling an ounce of nitre with a ſtrong heat, in order to expel dephlogiſticated air from it, only a few grains of weak nitrous acid are obtained, more or leſs as the fire applied is weak or ſtrong: but that the quantity of dephlogiſticated air extricated from it follows the contrary rule; being greateſt when the heat is moſt violent and ſuddenly applied, and leſs when the fire is gradually applied.

On calcining metals in dephlogiſticated air, very ſingular phenomena are obſerved, which ſeem to throw great light upon the compoſition of this fluid. "One of the moſt ſimple of all phlogiſtic proceſſes (ſays Dr Prieſtley), is that in which metals are melted in dephlogiſticated air. I therefore began with this, with a view to aſcertain whether any water be produced when the air is made to diſappear in it. Accordingly, into a glaſs veſſel, containing ſeven ounce-meaſures of pretty pure dephlogiſticated air, I introduced a quantity of iron turnings, which is iron in thin ſmall pieces, exceedingly convenient for theſe and many other experiments, having previouſly made them, together with the veſſel, the air, and the mercury by which it was confined, as dry as I poſſibly could. Alſo to prevent the air from imbibing any moiſture, I received it immediately in the veſſel in which the experiment was made, from the proceſs of procuring it from red precipitate, ſo that it had never been in contact with any water. I then fired the iron by means of a burning lens, and preſently reduced the ſeven ounce-meaſures to 0.65 of a meaſure; but I found no more water after this proceſs than I imagined it had not been poſſible for me to exclude, as it bore no proportion to the air which had diſappeared. Examining the reſiduum of the air, I found one-fifth of it to be fixed air; and when I tried the purity of that which remained by the teſt of nitrous air, it did not appear that any phlogiſticated air had been produced in the proceſs; for though it was more impure than I ſuppoſe the air with which I began the experiment muſt have been, it was not more ſo than the phlogiſticated air of the ſeven ounce-meaſures, which had not been affected by the proceſs, and which muſt have been contained in the reſiduum would neceſſarily make it. In this caſe, one meaſure of this reſiduum, and two of nitrous air, occupied the ſpace of 0.32 of a meaſure. In another experiment of this kind, ten ounce-meaſures of dephlogiſticated air were reduced to 0.8 of a meaſure, and by waſhing in lime-water to 0.38 of a meaſure. In another experiment, 7½ ounce meaſures of deplogiſticated air were reduced to half an ounce-meaſure, of which one-fifth was fixed air, and the reſiduum was quite as pure as the air with which I began the experiment; the teſt with nitrous air, in the proportions above mentioned, giving 0.4 in both caſes.

67
Dephlogiſticated air imbibed by calces of metals.

"In theſe experiments the fixed air muſt, I preſume, have been formed by the union of the phlogiſton from the iron and dephlogiſticated air in which it was ignited; but the quantity of it was very ſmall in proportion to the air which had diſappeared; and at that time I had no ſuſpicion that the iron, which had been melted and gathered into round balls, could have imbibed it; a melting heat having been ſufficient, as I had imagined, to expel every thing that was capable of aſſuming the form of air from any ſubſtance whatever. Senſible, however, that ſuch a quantity of air muſt have been imbibed by *ſomething*, to which it muſt have given a very perceptible addition of weight, and

68
Dephlogiſticated air imbibed by iron.

ſeeing nothing elſe that could have imbibed it, it occurred to me to weigh the calx into which the iron had been reduced; and I preſently found, that the dephlogiſticated air had actually been imbibed by the melted iron, in the ſame manner as inflammable air had been imbibed by the melted calces of metals in my former experiments, however improbable ſuch an abſorption might have appeared *à priori*. In the firſt inſtance, about twelve ounce-meaſures of dephlogiſticated air had diſappeared, and the iron had gained ſix grains in weight. Repeating the experiment very frequently, I always found that other quantities of iron, treated in the ſame manner, gained ſimilar additions of weight, which was always very nearly that of the air which had diſappeared.

69
Is capable of taking it up from the atmoſphere.

"Concluding from the preceding experiments, that iron, ſufficiently heated, was incapable of ſaturating itſelf with pure air from the atmoſphere, I then proceeded to melt it with the heat of a burning lens in the open air; and I preſently found, that perfect iron was eaſily capable of being fuſed in this way, and continued in this fuſion a certain time, exhibiting the appearance of *boiling* or throwing out air; whereas it was, on the contrary, imbibing air; and, when it was ſaturated, the fuſion ceaſed, and the heat of the lens could make no farther impreſſion upon it. When this was the caſe, I always found that it had gained weight in the proportion of 7½ to 24, which is very nearly one-third of the original weight. The ſame was the effect when I melted ſteel in the ſame circumſtances, and alſo every kind of iron on which the experiment could be tried. But I have reaſon to think, that with a greater degree of heat than I could apply, the iron might have been kept in a ſtate of fuſion ſomewhat longer, and by that means have imbibed more than even one-third of its original weight.

70
Remarkable phenomenon attending the melting of caſt-iron.

"There was a peculiar circumſtance attending the melting of caſt iron with a burning lens, which rendered it impoſſible to aſcertain the addition that was made to its weight, and at the ſame time afforded an amuſing ſpectacle: for the moment that any quantity of it was melted, and gathered into a round ball, it began to diſperſe in a thouſand directions, exhibiting the appearance of a moſt beautiful fire-work; ſome of the particles flying to the diſtance of half a yard from the place of fuſion; and the whole was attended with a conſiderable hiſſing noiſe. Some of the largeſt pieces, which had been diſperſed in this manner, I was able to collect, and having ſubjected them to the heat of the lens, they exhibited the ſame appearance as the larger maſs from which they had been ſcattered.

"When this caſt iron was melted in the bottom of a deep glaſs receiver, in order to collect all the particles that were diſperſed, they firmly adhered to the glaſs, melting it ſuperficially, though without making it crack, ſo that it was ſtill impoſſible to collect and weigh them. However, I generally found, that, notwithſtanding the copious diſperſion, what remained after the experiment rather exceeded than fell ſhort of the original weight of the iron."

71
Formation of water from dephlogiſticated and inflammable air.

On attempting to revive this calx of iron in inflammable air, a very new and unexpected appearance took place. Having put a piece of iron ſaturated with pure air into a veſſel filled with inflammable air confined by water, the inflammable air diſappeared and the metal was revived; but on weighing it, he found that 2½ grains out of 11½ had been loſt, beſides the 7½ ounce-meaſures of inflammable air which had vaniſhed. Conſidering all theſe circumſtances, the Doctor had now no doubt that the two kinds of air had united and formed either fixed air or water; and with a view to determine this point, he repeated the experiment in a veſſel where the inflammable was confined by mercury, both the veſſel and mercury having been previouſly made as dry as poſſible. In theſe circumſtances he had no ſooner begun to heat the iron, than the air was perceived to diminiſh, and at the ſame time the inſide of the veſſel to become cloudy, with particles of dew that covered almoſt the whole of it. Theſe particles by degrees gathered into drops, and ran down in all places, excepting thoſe which were heated by the ſunbeams. On collecting the water produced in this experiment, by means of a piece of filtering paper carefully introduced to abſorb it, he found it to be as nearly as poſſible of the ſame weight with that which had been loſt by the iron; and alſo in every experiment of this kind, in which he attended to the circumſtance, he found that the quantity of inflammable air which had diſappeared was about double that of the dephlogiſticated air ſet looſe in the operation, ſuppoſing that weight to have been reduced into air. Thus, at one time, a piece of this ſlag abſorbed 5½ ounce meaſures of inflammable air, while it loſt the weight of about three ounce-meaſures of dephlogiſticated air, and the water collected weighed two grains. Another time a piece of ſlag loſt 1.5 grains, and the water produced was 1.7 grains. In a third caſe, where 6½ ounce-meaſures of inflammable air were reduced to 0.92 of a meaſure, the iron had loſt the weight of 3.3 ounce-meaſures of dephlogiſticated air, or nearly two grains.

72
Quantity produced in this manner.

73
Experiments with copper, &c.

The Doctor having ſucceeded ſo well with iron, next tried the calx of copper, or thoſe ſcales which fly off from it by hammering whilſt it is red-hot; and found water produced in the inflammable air in the ſame manner as when the ſcales of iron were uſed. On uſing precipitate *per ſe*, he imagined at firſt that water was obtained from this ſubſtance alſo; but on repeating the experiment to more advantage, he found no more water than might be ſuppoſed to have been contained in an extraneous ſubſtance either in the inflammable air or in the red precipitate. With iron, however, the caſe was vaſtly different. As the Doctor had formerly ſatisfied himſelf that inflammable air always contains a portion of water, and alſo that when it has been ſome time confined by water it imbibes more, ſo as to be increaſed in its ſpecific gravity by that means, he repeated the experiment with inflammable air which had not been confined by that fluid, but was received in a veſſel of dry mercury from the veſſel in which it had been generated; but in this caſe the water was produced, to appearance, as copiouſly as in the former experiment. "Indeed (ſays he), the quantity of water produced, ſo greatly exceeding the weight of all the inflammable air, is ſufficient to prove that it muſt have had ſome other ſource than any conſtituent part of that air, or the whole of it, together with the water contained in it, without taking into conſideration the correſponding loſs of weight in the iron.

"I muſt here obſerve, that the iron ſlag which I had treated in this manner, and which had thereby loſt the weight which it had acquired in dephlogiſticated air, became perfect iron as at firſt, and was then capable of being melted by the burning lens again; ſo that the ſame piece of iron would ſerve for theſe experiments as long as the operator ſhould chooſe. It was evident, therefore, that if the iron had loſt its phlogiſton in the preceding fuſion, it had acquired it again from the inflammable air which it had abſorbed; and I do not ſee how the experiment can be accounted for in any other way."

74 Iron may be made to imbibe dephlogiſticated air as often as we pleaſe.

75 Experiments of Mr Cavendiſh, &c. on water.

As the experiments of Dr Prieſtley tend very much to throw ſome light on the compoſition of dephlogiſticated air, we ſhall here give an account of ſome others made by Mr Cavendiſh, as well as thoſe of Dr Prieſtley and the French chemiſts, upon water; From all which it is concluded by the moſt celebrated philoſophers and chemiſts, That dephlogiſticated air is one of the conſtituent and elementary parts of water, inflammable air being the other; though the opinion is ſtill conteſted by ſome foreign chemiſts.

Phil. Tranſ. lxxiv. 125.

"As there ſeemed great reaſon," ſays Mr Cavendiſh, "to think, from Dr Prieſtley's experiments, that the nitrous and vitriolic acids were convertible into dephlogiſticated air, I tried whether the dephlogiſticated part of common air might not be converted into nitrous or vitriolic acid." For this purpoſe he impregnated ſome milk of lime with the fumes of burning ſulphur, by burning 122 grains of ſulphur in a large glaſs receiver, in which ſome lac calcis was included. No nitrous ſalt, nor any thing beſides ſelenite, was produced in the proceſs. Neither was any nitrous acid produced by phlogiſticating common air with liver of ſulphur, or by treating dephlogiſticated air in the ſame manner. The liver of ſulphur uſed in theſe experiments was made with lime; and the only obſervation made on this occaſion was, that the ſelenite produced was much more ſoluble in water than when made with dephlogiſticated vitriolic acid.

76 Whether the phlogiſtication of air produces vitriolic acid.

To try whether any vitriolic acid was produced by the phlogiſtication of air, 50 ounces of diſtilled water were impregnated with the fumes produced on mixing 52 ounce-meaſures of nitrous air with a quantity of common air ſufficient to decompound it. This was done by filling a bottle with ſome of this water, and inverting it into a baſon of the ſame; and then by a ſyphon, letting in as much nitrous air as filled it half full; after which, common air was added ſlowly by the ſame ſyphon, till the nitrous air was decompounded. When this was done, the diſtilled water was further impregnated in the ſame manner till the whole quantity of nitrous air was employed. The impregnated water was ſenſibly acid to the taſte; and on diſtillation yielded firſt phlogiſticated nitrous acid, then water, and laſtly a very acid liquor, conſiſting of dephlogiſticated nitrous acid. By ſaturation with ſalt of tartar, 87½ grains of nitre, without any mixture of vitriolated tartar, or other vitriolic ſalt, were obtained.

77 Nitrous acid produced from dephlogiſticated and inflammable air.

Theſe experiments having proved unſucceſsful, Mr Cavendiſh next proceeded to try the effects of exploding dephlogiſticated and inflammable air together in cloſe veſſels. He begins with relating an experiment of Dr Prieſtley; in which, it was ſaid, that on firing a mixture of common and inflammable air by electricity, in a cloſe copper veſſel holding about three pints, a loſs of weight was always perceived, on an average about two grains, though the veſſel was ſtopped in ſuch a manner that no air could eſcape by the exploſion. It is alſo related, that on repeating the experiment, in glaſs veſſels, the inſide of the glaſs, though clean and dry before, immediately became dewy; which confirmed an opinion he had long entertained, that common air depoſits its moiſture by phlogiſtication. The experiment, however, did not ſucceed with Mr Cavendiſh, at leaſt with regard to the loſs of weight; which never exceeded the fifth part of a grain, and commonly was nothing at all. In theſe experiments the greateſt care was taken to obſerve with accuracy the diminution of air by the exploſion, and quality of the remainder; from which it appeared, that 423 meaſures of inflammable air were nearly ſufficient to phlogiſticate 1000 of common air, and that the bulk of air remaining after the exploſion is very little more than four-fifths of the common air employed; whence he concludes, that "when they are mixed in this proportion, almoſt all the inflammable, and about one-fifth of the common air, loſe their elaſticity, and are condenſed into the dew which lines the glaſs."

78 Quantity of inflammable air neceſſary to phlogiſticate common air.

To examine more exactly the nature of this dew, 500,000 grain-meaſures of inflammable air were burnt with about 2½ times the quantity of common air, and the burnt air was made to paſs through a glaſs cylinder eight feet long and three-fourths of an inch in diameter, in order to depoſit the dew. The two airs were conveyed ſlowly into this cylinder by ſeparate copper pipes, paſſing through a braſs plate which ſtopped up one end of the cylinder; and as neither inflammable nor common air can burn by themſelves, there was no danger of the flame ſpreading to the magazines from which they were conveyed. Each of theſe magazines conſiſted of a large tin veſſel inverted into another juſt big enough to receive it. The inner veſſel communicated with the copper pipe, and the air was forced out of it by pouring water into the outer veſſel; and in order that the quantity of common air expelled ſhould be 2½ times that of the inflammable air, the water was let into the other veſſels by two holes in the bottom of the ſame tin pan; the hole which conveyed the water into that veſſel in which the common air was confined being 2½ times as big as the other. In trying the experiments, the magazines being firſt filled with their reſpective airs, the glaſs cylinder was taken off, and water let by the two holes into the outer veſſels, till the airs began to iſſue from the ends of the copper pipes; they were then ſet on fire by a candle, and the cylinder put on again in its place. By this means upwards of 135 grains of water were left in the cylinder, which had no taſte nor ſmell, and which left no perceptible ſediment on being evaporated to dryneſs; neither did it yield any pungent ſmell during the evaporation; in ſhort, it ſeemed pure water. In one of his experiments a little ſooty matter was perceived, but it was found to proceed from the luting. On repeating the experiment with dephlogiſticated, inſtead of common air, the produce was nitrous acid.

The following concluſion is drawn by Mr Cavendiſh from all theſe experiments: "There ſeem two ways by which the production of the nitrous acid, in the manner abovementioned, may be explained; firſt, by ſuppoſing that dephlogiſticated air contains a little nitrous acid, which enters into it as one of its component parts;

79 Concluſions from theſe experiments.

parts; and that this acid, when the inflammable air is in ſufficient proportion, unites to the phlogiſton, and is turned into phlogiſticated air, but does not when the inflammable air is in too ſmall proportion: and, ſecondly, by ſuppoſing that there is no nitrous acid mixed with or entering into the compoſition of dephlogiſticated air; but that, when the air is in ſufficient proportion, part of the dephlogiſticated air with which it is debaſed is, by the ſtrong affinity of phlogiſton to dephlogiſticated air, deprived of its phlogiſton, and turned into nitrous acid; whereas, when the dephlogiſticated air, is not more than ſufficient to conſume the inflammable air, none then remains to deprive the phlogiſticated air of its phlogiſton, and turn it into acid.—If the latter explanation be true, I think we muſt allow that dephlogiſticated air is in reality nothing but *dephlogiſticated water*, or water deprived of its phlogiſton; or, in other words, that water conſiſts of dephlogiſticated air united to phlogiſton. On the other hand, if the former explanation be true, we muſt ſuppoſe, that dephlogiſticated air conſiſts of water united to a little nitrous acid, and deprived of its phlogiſton; but ſtill the nitrous acid in it muſt only make a very ſmall part of the whole, as it is found that the phlogiſticated air into which it is converted is very ſmall in compariſon of the dephlogiſticated air. I think the ſecond of theſe explanations ſeems much the more likely; as it was found that the acid in the condenſed liquor was of the nitrous kind, not only when the dephlogiſticated air was prepared from nitrous acid, but when procured from plants or turbith mineral. Another ſtrong argument in favour of this opinion is, that dephlogiſticated air yields no nitrous acid when phlogiſticated by liver of ſulphur; for if this air contains nitrous acid, and yields it when phlogiſticated by exploſion with inflammable air, it is very extraordinary that it ſhould not do ſo by other means. But what forms a ſtronger, and, I think, almoſt deciſive argument in favour of this explanation, is, that when the dephlogiſticated air is very pure, the condenſed liquor is made much more ſtrongly acid by mixing the air to be exploded with a little phlogiſticated air.”

80 Dr Prieſtley's experiments.

The experiments of Dr Prieſtley alluded to were thoſe in which inflammable air was ſuppoſed by Mr Lavoiſier to be procured from water by paſſing its ſteam through red-hot iron tubes. It was ſoon diſcovered, however, by Dr Prieſtley, that this inflammable air did not proceed from the water, but from the iron of the tube; and might be obtained by tranſmitting aqueous vapour through charcoal or iron placed in tubes of copper, glaſs, or earthen ware, made red-hot, but not through theſe tubes by themſelves. In this caſe, the loſs of the water employed exceeded that of the inflammable air produced in the proportion of 1.3 to 2; and the iron which had thus abſorbed the water, appeared exactly ſimilar to that which had been burned in dephlogiſticated air in the manner already related. His concluſions from thence are theſe: “Since iron gains the ſame addition of weight by being melted in dephlogiſticated air, and alſo by the addition of water when red hot, and becomes, as I have already obſerved, the ſame ſubſtance in all reſpects, it is evident that this air or water, as exiſting in the iron, is the very ſame thing; and this can hardly be explained but on the ſuppoſition that water conſiſts of two kinds of air, viz. inflammable and dephlogiſticated.”

81 His opinion concerning the compoſition of water.

Of theſe proceſſes he gives the following explanation: “When iron is heated in dephlogiſticated air, we may ſuppoſe, that, though part of its phlogiſton eſcapes, to enter into the compoſition of the ſmall quantity of fixed air which is then procured, yet enough remains to form water with the dephlogiſticated air which it has imbibed, ſo that this calx conſiſts of the intimate union of the pure earth of iron and of water; and therefore, when the ſame calx, thus ſaturated with water, is expoſed to heat in inflammable air, this air enters into it, deſtroys the attraction between the water and the earth, and revives the iron, while the water is expelled in its proper form.”

The whole of the Doctor's opinions on the component parts of this kind of air, however, are ſummed up in the following ſentence in his *Obſervations relating to Theory*.—“The only kind of air that is now thought to be properly elementary, and to conſiſt of a ſimple ſubſtance, is dephlogiſticated air; with the addition at leaſt of the principle of heat, concerning which we know very little; and as it is not probable that this adds any thing to the *weight* of bodies, it can hardly be called an *element* in their compoſition. Dephlogiſticated air appears to be one of the elements of water, of fixed air, of all the acids, and many other ſubſtances, which, till lately, have been thought to be ſimple.”

Obſerv. and Exper. vi. 402.

82 Experiments of the French philoſophers.

The experiments of the French philoſophers were of the ſame nature with thoſe of Mr Cavendiſh, but conducted on a larger ſcale. The inference drawn from them was the ſame with that already mentioned, viz. that dephlogiſticated and inflammable air in all caſes are the two conſtituent parts of water. This opinion is adopted by Mr Kirwan in his *Treatiſe on Phlogiſton.*

83 Mr Kirwan's concluſions from them.

“The experiments of Mr Cavendiſh, and of Mr Monge,” ſays he, “appear to me to leave no room to doubt, that when very pure dephlogiſticated and inflammable air are inflamed, the product is mere water (A): for when theſe airs are employed in the proper proportion, only 0.02 of the mixture of both airs retains its aërial from. Now it is impoſſible to ſuppoſe that all the water obtained pre-exiſted in theſe airs; that is, that 49 parts in 50 were mere water.”

84 The foregoing theories not altogether ſatiſfactory.

Notwithſtanding theſe poſitive concluſions, however, by ſome of the moſt reſpectable names in England, the evidences adduced have been unſatiſfactory to ſome French chemiſts; who maintain, that Meſſrs Cavendiſh, Prieſtley, and Kirwan, are totally miſtaken with regard to the production of water from dephlogiſticated and inflammable air; contending, that the water obtained had previouſly exiſted in the air, and was not originally produced in the operation. The fact, indeed, becomes ſomewhat dubious from ſome experiments related by Dr Prieſtley himſelf, and of which we ſhall now proceed to give an account.

(A) The experiments of Mr Cavendiſh ſhow that nitrous acid is the product in this caſe. He takes notice of the difference between the reſult of the French experiments and his, but aſcribes it to their uſing inflammable air prepared from charcoal: His was from zinc.

85 **Difficulties ariſing in ſome of Dr Prieſtley's experiments.**

One conſequence of the hypotheſis in queſtion is evident, that if water really be *produced* by the dephlagration of either dephlogiſticated or common air with inflammable air, the quantity of liquid obtained ought to increaſe in proportion to the quantity of the two airs conſumed, and that without any limitation. This, however, is not the caſe, as Dr Prieſtley has obſerved. He had ſucceeded indeed with ſcales of iron and copper, as has already been related; and in the experiment with the latter, the production of water was ſo copious, that when only 3½ ounce-meaſures of air were abſorbed, the water ſtood in drops on the inſide of the veſſel, and ſome of theſe ran down it. Water was alſo procured by firing dephlogiſticated and inflammable air from iron by the electric ſpark in a cloſe veſſel, an experiment ſimilar to thoſe made by Mr Lavoiſier at Paris. In his firſt experiment he put 3.75 ounce meaſures of a mixture of air, of which one-third was dephlogiſticated and two-thirds inflammable air from iron, in a cloſe veſſel, and, after the exploſion, found in it one grain of moiſture; but on repeating the experiment with half as much dephlogiſticated as inflammable air, he could perceive no ſign of moiſture. The greateſt difficulty, however, which he ſays he ever met with reſpecting the preceding theory, aroſe from his never having been able to procure any water when he revived red precipitate in inflammable air, or at leaſt no more than might have been ſuppoſed to be contained in the inflammable air as an extraneous ſubſtance.

In order to make the experiments with the ſcales of iron and that with the red precipitate as much alike as poſſible, and compare them both to the greateſt advantage, he made them one immediately after the other with every circumſtance as nearly the ſame as he could. The inflammable air was the ſame in both experiments, and both the ſcales of iron and red precipitate were made as dry as poſſible. They were heated in veſſels of the ſame ſize and form, and equally confined by dry mercury; and yet, with the former, water was produced as copiouſly as before, viz. running down the ſide of the veſſel in drops, when only four ounce-meaſures of inflammable air were abſorbed; but though he heated the red precipitate till eight ounce-meaſures of the inflammable air were abſorbed, and only 0.75 of an ounce-meaſure remained, there was hardly any ſenſible quantity of water produced, "certainly," ſays he, "not one-tenth of what appeared in the experiment with the ſcales of iron. In this experiment there can be no doubt but that the dephlogiſticated air produced from the red precipitate united with the inflammable air in the veſſel; and as no *water* equal to the weight of the two kinds of air was produced, they muſt have formed ſome more *ſolid ſubſtance*, which, in the ſmall quantities I was obliged to uſe, could not be found.

" The difficulty, with reſpect to what becomes of the two kinds of air, was not leſſened by the attempts which I made to collect all that I could from repeated decompoſitions of inflammable and dephlogiſticated air in a cloſe veſſel. As I had produced water in this proceſs when no more than a ſingle exploſion was made at a time, I thought that by continuing to make exploſions in the ſame veſſel, the water would not fail to accumulate till any quantity might be collected; and I intended to have collected a conſiderable part of an ounce. And as I ſhould know exactly what quantity of air I decompoſed, I had no doubt of being able to aſcertain the proportion that the water and air bore to each other. With this view a mixture was made of a large quantity of air, one-third dephlogiſticated and two-thirds inflammable, from iron and oil of vitriol.—But though I had a ſenſible quantity of water at the firſt exploſion (in each of which between four and five ounce-meaſures of the mixture of air were uſed), I was ſurpriſed to perceive no very ſenſible increaſe of the quantity of water on repeating the exploſions. Having therefore expended 48 ounce-meaſures of the mixture, the proceſs was diſcontinued; and, collecting the water with all the care that I could, I found no more than three grains, when there ought to have been eleven.

86 **Incondenſible vapour ariſing from water.**

" In this proceſs the inſide of the veſſel was always very black after each exploſion; and when I poured in the mercury after the exploſion, though there was nothing viſible in the air within the veſſel, there iſſued from the mouth of it a denſe vapour. This was the caſe, though I waited ſo long as two minutes after any exploſion, before I proceeded to put in more mercury in order to make another; which, if the vapour had been ſteam, would have been time more than ſufficient to permit it to condenſe into water. I even perceived this vapour when I had a quantity of water in the veſſel, and the exploſion was conſequently made over it, as well as in contact with the ſides of the veſſel which were wetted with it; ſo that, as this vapour had paſſed through the whole body of water when the veſſel was inverted, it is probable that it muſt have conſiſted of ſomething elſe than mere water. But I was never able to collect any quantity of it, though it muſt have been ſomething produced by the union of the two kinds of air."

In order to collect a quantity of this vapour, he contrived an apparatus, which, by diffuſing it through a thin glaſs veſſel, he ſuppoſed would condenſe all the contents whether fluid or ſolid; but after repeating the experiment as carefully as poſſible, by taking 20 exploſions, and repeating the whole ſeveral times over, he could find nothing in the veſſel beſides a ſmall quantity of water, which, added to that in the ſtrong veſſel, came far ſhort of the weight of the air that was decompoſed.

87 **Prieſtley's conjecture concerning this vapour.**

" All the conjecture," ſays he, " that I can advance, in order to explain this phenomenon is, that ſince ſoot yields pure air, part of the ſoot is formed by the union of the dephlogiſticated air in the atmoſphere, and the inflammable air of the fuel: but *ſmoke*, which contains much *ſoot*, is ſoon diſperſed, and becomes inviſible in the open air. Such, therefore, may be the caſe here. The ſoot formed by the union of the two kinds of air, may be diffuſed through the air, in the veſſel in which they are exploded, and be carried inviſibly into the common atmoſphere; which may account for my not being able to collect any quantity of it in this apparatus."

88 **Unſucceſsful attempts to collect it.**

Not diſcouraged by this bad ſucceſs, the Doctor attempted to collect this volatile matter by means of a quantity of water incumbent upon the mercury in the ſtrong glaſs veſſel in which the exploſions were made, though he had found that part of it could eſcape through the water. He decompoſed a great quantity of the two kinds of air in theſe circumſtances; and preſently found that the water became very cloudy, and was at length filled with a blackiſh matter. This he collected, and found that it remained perfectly black upon the earthen veſſel in which the water containing it was evaporated; which would not have been the caſe if the blackiſh matter in the water had been that powder of mercury which is produced by agitating it in pure water: For that black maſs always became white running mercury the moment the water was evaporated from it. If a ſufficient quantity of this matter could have been procured, he could have ſatisfied himſelf whether it was ſoot or not.

89 Water in conſiderable quantity obtained from dephlogiſticated and inflammable air. See Plate X. fig. 3.

“ That water, in great quantities (ſays he), is ſometimes produced from burning inflammable and dephlogiſticated air, is evident from the experiments of Meſſrs Cavendiſh and Lavoiſier. I have alſo frequently collected conſiderable quantities of water in this way, though never quite ſo much as the weight of the two kinds of air depoſited. My apparatus for this purpoſe was the following: Into the mouth of a large glaſs balloon, I introduced a tube, from the orifice of which there continually iſſued inflammable air from a veſſel containing iron and oil of vitriol. This being lighted, continued to burn like a candle. Preſently after the lighting of it, the inſide of the balloon always became cloudy, and the moiſture ſoon gathered in drops, and ſettled in the lower part of the balloon. To catch what might iſſue in the form of vapour, in the current of air through the balloon, I placed the glaſs tube *b*, in which I always found ſome water condenſed. It is very poſſible, however, that in both theſe modes of experimenting, the water may be converted into a kind of vapour, which is very different from ſteam, and capable of being conveyed a great way through air, or even water, without condenſation along with the air with which it is mixed; and on this account it may not be poſſible, in either of theſe modes of experimenting, to collect *all* the water into which the two kinds of air may be converted. The nature of this kind of vapour into which water may be changed, and which is not readily condenſed by cold, is very little underſtood, but well deſerves the attention of philoſophers.

“ That the water collected in the balloon comes from the decompoſition of the air, and not from the freſh air circulating through it, was evident from placing balls of hot iron in the place of the flame, and finding that, though the balloon was as much heated by them as by the flame of the burning of the inflammable air, and conſequently there muſt have been the ſame current of the external air through it, no moiſture was found in the balloon.”

Sect. IV. *Of Phlogiſticated Air.*

89 Phlogiſtication of air explained.

The univerſal prejudice in favour of the exiſtence of that principle named *Phlogiſton*, firſt ſuggeſted by Stahl, gave riſe, on the firſt appearance of Dr Prieſtley's diſcoveries, to a theory, concerning the action of this ſubſtance upon air and other bodies. As it had been obſerved, that air was diminiſhed, in ſome caſes at leaſt, by burning, univerſally by reſpiration, and by ſome other proceſſes, it was imagined that phlogiſton was a body of ſuch a ſingular nature, that when mixed with air, it always diminiſhed its bulk, inſtead of enlarging it, which might have been more naturally expected from the mixture of any vapour whatever. It was alſo ſuppoſed by ſome, that the phlogiſton was not only entirely devoid of gravity, but that it was a principle of *poſitive levity;* ſo that the *abſolute* weight of bodies was diminiſhed by an union with it, and augmented when it was expelled, though their *ſpecific* gravity was diminiſhed. Various other ſurpriſing properties were attributed to phlogiſton; ſuch as that of giving elaſticity to air, of conſtituting the flame by a *chemical combination* with air, &c. Its emiſſion into the atmoſphere was ſuppoſed to be always attended with a diminution of air; and therefore, all proceſſes in which air was diminiſhed and became noxious, ſuch as that by liver of ſulphur, a mixture of iron filings and brimſtone, &c. were called *phlogiſtic proceſſes*. Reſpiration of animals was taken into the ſame account; but neither in this, nor in combuſtion, was it allowed that any kind of vital ſpirit was abſorbed by the blood, or ſeparated from the air by the burning body. On the contrary, it was ſtrenuouſly argued, that all this was performed by the *emiſſion* of *phlogiſton* from the lungs or the inflamed ſubſtance, which depraved the air, and diminiſhed it in bulk; and as all air was ſuppoſed to contain phlogiſton, it was likewiſe imagined, that in all caſes where air was mended, as by the growing of vegetables, or agitation in water, the emendation was accompliſhed, not by the emiſſion of any thing in the atmoſphere, but by the mere abſorption of phlogiſton. In other reſpects this ſubſtance was thought to be an exceedingly powerful principle in nature; the light of the ſun itſelf and the electric fluid being ſaid to be modifications of it, the different kinds of airs to be *phlogiſtic vapours*, &c.; ſo that the whole ſyſtem of nature ſeemed ready to be abſorbed by it at once.

90 Too great powers attributed to phlogiſton.

91 Doctrine of phlogiſton oppoſed by the foreign chemiſts.

The formidable powers of this principle were firſt checked by the diſcoveries of Mr Lavoiſier, though the latter erred equally on the contrary ſide; and not content with keeping the phlogiſtic principle within due bounds, would needs deny its exiſtence altogether*. In a treatiſe publiſhed in the year 1782, he firſt impugns Dr Prieſtley's theory of reſpiration, and denies that “ the reſpiration of animals has the property of phlogiſticating air in a manner ſimilar to what is effected by the calcination of metals and many other chemical proceſſes; and that it ceaſes not to be reſpirable till the inſtant when it becomes ſurcharged, or at leaſt ſaturated, with phlogiſton.”

92 Mr Lavoiſier's experiments on calcination of metals and reſpiration.

In order to diſprove this aſſertion, he introduced four ounces of mercury to 50 cubic inches of common air, propoſing to calcine the metal by keeping it for 12 days in a heat almoſt equal to that which is neceſſary to make it boil. After the expiration of the appointed time, 45 grains of precipitate *per ſe* were formed, and the air in the veſſel was diminiſhed by about $\frac{1}{6}$th of its volume. In this ſtate it did not precipitate lime water; but inſtantly extinguiſhed candles, and killed animals immerſed in it; no longer affording any red vapours, or being diminiſhed by mixture with nitrous air: On diſtilling the precipitate produced, about as much dephlogiſticated air was obtained as had been left by the common air in the calcination; and by recombining this with the noxious air left in the veſſel, he recompoſed a fluid nearly of the ſame goodneſs with common air. Hence he draws the following concluſions:

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* See *Phlogiſton.*

93 Compoſition of atmoſpherical air.

ſions: 1. That $\frac{5}{6}$ths of the air we breathe are mephitic, or incapable of ſupporting the reſpiration of animals, or the inflammation and combuſtion of bodies. 2. That the ſurplus, or only $\frac{1}{6}$th of the volume of atmoſpherical air, is reſpirable. 3. That in the calcination of mercury, this metallic ſubſtance abſorbs the ſalubrious part, leaving only the mephitic portion of the air. 4. That by reuniting thoſe two portions which had been ſeparated, we can recompound air ſimilar to that of the atmoſphere.

94 Effects of reſpiration on air.

To determine the effects of reſpiration upon air, a live ſparrow was placed under a glaſs receiver, filled with common air and inverted in mercury, containing 31 cubic inches. In a quarter of an hour it became agitated, and in 55 minutes died convulſed. Notwithſtanding the heat of the animal, which neceſſarily, at firſt, rarified the air in the receiver, there was a ſenſible diminution of its bulk; which, at the end of 15 minutes, amounted to one-fortieth: but, inſtead, of increaſing afterwards, the diminution became ſomething leſs in about half an hour; and when the animal was dead, and the air in the receiver had recovered the temperature of the room where the experiment was made, the diminution did not appear to exceed one-ſixteenth part.—This air which had been reſpired by the ſparrow, though in many reſpects ſimilar to that in which the mercury had been calcined, differed from it in this reſpect, that it precipitated lime-water, and, by introducing cauſtic fixed alkali to it, was reduced one-ſixth in bulk by the abſorption of fixed air; after which it appeared exactly the ſame with that produced by the calcination of mercury or other metals; and atmoſperical air was recompoſed by mixing this with pure dephlogiſticated air in the proportions already mentioned.

95 Scheele's experiments.

That common air is compounded of two kinds of elaſtic fluids, Mr Scheele has proved by the following experiment: "I diſſolved (ſays he) one ounce of alkaline liver of ſulphur in eight ounces of water; of this ſolution I poured four ounces into an empty bottle, whoſe capacity was 24 ounces, and worked it well; then I turned the bottle, immerſed its neck into a ſmall veſſel with water, and kept it in this poſition a fortnight. The ſolution had partly loſt its red colour, and ſome ſulphur had been precipitated from it during this time. After this I put the bottle in the ſame poſition in a larger veſſel with water, keeping the mouth and neck under water, and the bottom of the bottle above water, and thus I drew the cork under water, which immediately ruſhed with violence into the bottle. On examining the quantity of water in the bottle, it was found, that during this fortnight, ſix parts out of 20 of air were loſt." On repeating the experiment with the ſame materials, and in the ſame bottle, only four parts out of 20 were loſt by ſtanding a week, and no more than ſix after four months.

96 Compoſition of atmoſpherical air demonſtrated.

From theſe experiments, and many others ſimilar, it appears that the doctrine of phlogiſton had been carried too far by Dr Prieſtley and other Britiſh philoſophers, and that the air conſiſts of two kinds of fluids; one perfectly ſalutary, and friendly in the higheſt degree to animal life; the other altogether unfit for it. Theſe two appear incapable of being converted directly into one another by any proceſs, natural and artificial: for though both are deſtructible, yet they are always converted into other ſubſtances; from which, indeed, either the one or the other may be extracted at pleaſure by employing the proper methods. The ſtrongeſt arguments in favour of the tranſmutation of phlogiſticated air into that of a purer kind, were drawn from the purification of noxious air by vegetation, and by agitation in water. In the former caſe, however, it has been obſerved in the laſt ſection, that this ſeeming purification is no other than an exchange of the one air for the other; the vegetables abſorbing the phlogiſticated, and emitting the dephlogiſticated air in its ſtead.

97 How air is purified by agitation in water.

Exper. and Obſerva. vi. 385.

With reſpect to the agitation in water, the matter remained more dubious; and it is only in the laſt volume of Dr Prieſtley's treatiſe that we have any account of this being accompliſhed by an emiſſion of purer air from the water.—"In the infancy of my experiments," ſays he, "I concluded, that all kinds of air were brought by agitation to the ſame ſtate; the pureſt air being partially phlogiſticated, and air completely phlogiſticated being thereby made purer; inflammable air alſo loſing its inflammability, and all of them brought into ſuch a ſtate as that a candle would juſt go out in them. This inference I made from all the kinds of air with which I was then acquainted, and which did not require to be confined by mercury, being brought to that ſtate by agitation in a trough of water, the ſurface of which was expoſed to the open air; never imagining that when the air in my jar was ſeparated from the common air by a body of water, generally about twelve inches in depth (adding that within to that without the jar), they could have any influence on each other. I have, however, been long convinced, that, improbable as it then appeared to me, this is actually the caſe."

98 Water pervious to air, and purifies it in paſſing through.

This remarkable fact is illuſtrated by the following experiments: 1. About three ounce-meaſures of air, phlogiſticated by nitrous air, were agitated for a quarter of an hour in a veſſel containing 20 ounces of water, which had been boiled for ſeveral hours, and which was ſtill very warm. By this proceſs it became diminiſhed one-ſixth, and conſiderably improved in quality. The next day the remainder was agitated for another quarter of an hour, and the water which had been boiled at the ſame time, when it was alſo diminiſhed in quantity and improved in quality. 2. An equal quantity of air, phlogiſticated by means of iron-filings and brimſtone, being agitated for 20 minutes, was diminiſhed one-ſeventh, and improved ſo far that a candle would burn in it. 3. After expelling all the air he could from the quantity of water by boiling, he put to it, in ſeparate phials, air that had been phlogiſticated with iron-filings and brimſtone, as well as that which the heat had expelled, leaving them with their mouths in water, and agitating them occaſionally. On examining the phials in about two months, he found both the air that was confined by water and that which had been expelled by heat, completely phlogiſticated. 4. That water does imbibe the purer part of the atmoſphere, in preference to that which is impure, is evident, he ſays, from any examination of it: For if the water be clear, and free from any thing that is putreſcent, the air expelled from it by heat is generally of the ſtandard of 1; whereas that of the atmoſphere, when the nitrous air is the pureſt, is about 1.2.

99 Properties of phlogiſticated air.

Phlogiſticated air is equally inviſible with common air, and ſomething more elaſtic. Mr Kirwan procured ſome perfectly phlogiſticated, ſo that it was not in the leaſt diminiſhed by nitrous air, from a mixture of iron filings and brimſtone. Having dried it by frequently introducing dry filtering paper under the jar that contained it, he found its weight to be to that of the common air as 985 to 1000, the barometer ſtanding at 30.46 and the thermometer at 60°. The other properties of it are, that it is extremely fatal to animal life, and friendly to that of vegetables, inſomuch that it is now generally believed to be the true and proper nouriſhment of the latter. It ſeems to exiſt originally, in very large quantity, in our atmoſphere. It may be ſeparated from the common maſs of air by combuſtion, by reſpiration, by putrefaction, and in ſhort by every ſpecies of phlogiſtic proceſs; neither is there any other ſpecies of air but what may be converted into this by means of fire, dephlogiſticated air alone excepted.

100 Nitrous acid procured from phlogiſticated air.

Phlogiſticated air is now generally believed to be a combination of the nitrous acid with phlogiſton; and that, in its gradual progreſs towards this, which is its ultimate ſtage, it firſt aſſumes the character of phlogiſticated nitrous acid; then of nitrous air, in which it readily parts with its phlogiſton to the atmoſphere, or rather to the dephlogiſticated part of it; and laſtly, it becomes phlogiſticated air, in which the union betwixt the principles is ſo ſtrong, that it cannot be broken by ſimple expoſure to dephlogiſticated air without heat; though the experiments of Mr. Cavendiſh ſhow, that this may be done by means of the electric ſpark, which produces the moſt violent heat we can imagine.

It had been frequently obſerved, that common atmoſpherical air was always diminiſhed by taking the electric ſpark in it; and this diminution was ſuppoſed to be occaſioned by the *phlogiſtication* of the air, and ſeparation of its fixed part; in conſequence of which it was urged, that lime water is precipitated by taking the electric ſpark over it in a ſmall quantity of air. Mr Cavendiſh, however, who has carefully examined this ſubject, denies that any fixed air is produced in this manner; and by a ſet of very curious experiments publiſhed in the 75th volume of the Philoſophical Tranſactions, has clearly ſhown that nitrous acid, and not fixed air, is the product of this operation.

101 Mr Cavendiſh's experiments on the production of nitrous acid.

The apparatus uſed in theſe experiments, was that repreſented Plate X. fig. 4, and conſiſts only of a crooked glaſs tube, whoſe ends are plunged into quickſilver contained in two glaſſes, in the middle part of which the air is confined betwixt the two portions of quickſilver. The air was introduced by means of a ſmaller tube, fig. 5. the tube M of the former figure being filled with quickſilver, the bent end of which was introduced into a jar DEF, filled with the proper kind of air, and inverted in water. The end C being ſtopped by the finger, the quickſilver was thus prevented from falling out, let the tube be placed in what poſition it would, until this preſſure was removed. Upon introducing the crooked tube into the jar in the poſition repreſented in the figure, and removing the finger from the orifice at C, the quickſilver would deſcend; and by ſtopping this orifice again, any quantity of the fluid may be allowed to run out, and the empty ſpace of the tube will be filled with the air deſired. Having thus got the proper quantity of air into the tube ABC, it was held with the end C uppermoſt, and ſtopped with the finger; and the end A made ſmaller for that purpoſe, being introduced into the end of the bent tube M, the air, on removing the finger from C, was forced into that tube by the preſſure of the quickſilver in the leg BC. Thus he was enabled to introduce any quantity he pleaſed of any kind of air into the tube M; and by the ſame means it was in his power to let up any quantity of ſoap-ley, or other liquor which he wanted to be in contact with it. In one caſe, however, in which he wiſhed to introduce air into the tube many times in the ſame experiment, he made uſe of the apparatus repreſented fig. 6, conſiſting of a tub AB, of a ſmaller bore, a ball C and a tube DE of a larger bore. This apparatus was firſt filled with quickſilver; and then the ball C and the tube AB were filled with air, by introducing the end A under a glaſs inverted into water, which contained the proper kind of air, and drawing out the quickſilver from the leg ED by a ſyphon. After being thus furniſhed with air, the apparatus was weighed, and the end A introduced into one end of the tube M, and kept there during the experiment; the way of forcing air out of this apparatus into the tube being by thruſting down the tube ED, a wooden cylinder of ſuch a ſize as almoſt to fill up the whole bore, and by occaſionally pouring quickſilver into the ſame tube, to ſupply the place of that puſhed into the ball C. After the experiment was finiſhed, the apparatus was weighed again, which ſhowed exactly how much air had been forced into the tube M during the whole experiment; it being equal in bulk to a quantity of quickſilver, whoſe weight was equal to the increaſe of weight of the apparatus. The bore of the tube M, uſed in theſe experiments, was about the tenth of an inch in diameter; and the length of the column of air occupying the upper part of the tube was in general from $\frac{3}{4}$ths to 1$\frac{1}{2}$ inches.—In order to force an electrical ſpark through the tube M, it was neceſſary to place an inſulated ball at ſuch a diſtance from the conductor as to receive a ſpark from it, and to make a communication between that ball and the quickſilver in one of the glaſſes, while the quickſilver in the other glaſs communicated with the ground.

When the electric ſpark was made to paſs through common air included between ſhort columns of a ſolution of litmus, the ſolution acquired a red colour, and the air was diminiſhed, as had been obſerved by Dr Prieſtley. When lime-water was uſed inſtead of the ſolution of litmus, and the ſpark was continued till the air could be no farther diminiſhed; but not the ſmalleſt cloud be perceived in the water, though the air was reduced to two-thirds of its original bulk: which is a greater diminution than it could have ſuffered by any phlogiſtic proceſs, that being little more than one-fifth of the whole. The experiment being repeated with impure dephlogiſticated air, a great diminution took place, but without any cloud in the lime-water. Neither was any cloud produced when fixed air was let up into it; but, on the addition of a little cauſtic volatile alkali, a brown ſediment immediately appeared.

It being thus evident that the lime was ſaturated by ſome acid produced in the operation, the experiment was repeated with ſoap-leys, to diſcover the nature of it. A previous experiment had been made in order to know what degree of purity the air ought to be of to produce the greateſt diminution; and thus it was found,

102
Proportions of the different airs neceſſary for the production of nitrous acid.

found, that when good dephlogiſticated air was uſed, the diminution was but ſmall; where perfectly phlogiſticated air was made uſe of, no ſenſible diminution took place; but when five parts of pure dephlogiſticated air were mixed with three of common air, almoſt the whole was made to diſappear.—It muſt be remembered, that common air conſiſts of one part of dephlogiſticated and four of plogiſticated air; ſo that a mixture of five parts of pure dephlogiſticated air and three of common air, is the ſame thing as a mixture of ſeven parts of dephlogiſticated air with three of phlogiſticated. Having made theſe previous trials, he introduced into the tube a little ſoap-leys, and then let up ſome dephlogiſticated and common air mixed in the abovementioned proportions, which, riſing into the tube M, divided the ſoap-leys into its two legs. As faſt as the air was diminiſhed by the electric ſpark, he continued to add more of the ſame kind till no further diminution took place. The ſoap-leys being then poured out of the tube, and ſeparated from the quickſilver, ſeemed to be perfectly neutralized, as they did not at all diſcolour paper tinged with blue flowers. On evaporating the liquor to dryneſs, a ſmall quantity of ſalt was left, which was evidently nitre, from the manner in which a paper impregnated with the ſolution of it burned. On repeating the experiment on a larger ſcale, with five times the quantity of materials, pure nitre was obtained in proportion, and was found, by the teſt of *terra ponderoſa ſalita*, to contain no more vitriolic acid than what might have been expected in the ſoap-ley itſelf, and which is exceedingly ſmall.

103
Mr Cavendiſh's opinions on the nature of phlogiſticated air.

As in ſome former experiments of Mr Cavendiſh, it had beeen found, that by deflagrating nitre with charcoal, the whole of the acid was converted into phlogiſticated air, he concluded that this kind of air is nothing elſe than nitrous acid united to phlogiſton: according to which, it ought to be converted into nitrous acid by being deprived of its phlogiſton. "But (ſays he) as dephlogiſticated air is only water deprived of phlogiſton, it is plain, that adding dephlogiſticated air to a body, is equivalent to depriving it of phlogiſton, and adding water to it; and therefore phlogiſticated air ought alſo to be reduced to nitrous acid, by being made to unite or form a chemical combination with dephlogiſticated air; only the acid thus formed will be more dilute than if the phlogiſticated air was ſimply deprived of phlogiſton.

"This being premiſed, we may ſafely conclude, that in the preſent experiments, the phlogiſticated air was enabled, by means of the electric ſpark, to unite to or form a chemical combination with, the dephlogiſticated air, and was thereby reduced to nitrous acid, which united to the ſoap-leys, and formed a ſolution of nitre; for in theſe experiments the two airs actually diſappeared, and nitrous acid was formed in their room: and as it has been ſhown, from other circumſtances, that phlogiſticated air muſt form nitrous acid when combined with dephlogiſticated air, the abovementioned opinion ſeems to be ſufficiently eſtabliſhed. And a further confirmation is, that no diminution of air is perceived when the electric ſpark is paſſed either through pure dephlogiſticated or through perfectly phlogiſticated air; which indicates a neceſſity for the combination of the two in order to produce nitrous acid. It was alſo found by the laſt experiment, that the quantity of nitre produced was the ſame that would have been obtained from the ſoap-leys, had they been ſaturated with nitrous acid; which ſhows, that the production of the nitre was not owing to any decompoſition of the ſoap-leys.

"The ſoap-leys uſed in the foregoing experiments were made from ſalt of tartar prepared without nitre, and were of ſuch a ſtrength as to yield one-tenth of their weight of nitre when ſaturated with nitrous acid. The dephlogiſticated air was alſo produced without nitre; that uſed in the firſt experiment with the ſoap-leys being procured from the black powder formed by the agitation of quickſilver mixed with lead, and that uſed in the latter from turbith mineral. In the firſt experiment, the quantity of ſoap-leys uſed was 35 meaſures, each of which was equal in bulk to one grain of quickſilver; and that of the air abſorbed was 416 ſuch meaſures of phlogiſticated air and 914 of dephlogiſticated. In the ſecond experiment, 178 meaſures of ſoap-leys were uſed; which abſorbed 1920 of phlogiſticated air and 4860 of dephlogiſticated. It muſt be obſerved, however, that in both experiments ſome air remained in the tube undecompoſed, whoſe degree of purity I had no means of trying; ſo that the proportion of each ſpecies of air abſorbed cannot be known with much exactneſs.

104
Experiment to determine the nature of phlogiſticated air.

"As far as the experiments hitherto publiſhed extend, we ſcarcely know more of the nature of the phlogiſticated part of the atmoſphere, than that it is not diminiſhed by lime-water, cauſtic alkalis, or nitrous air; that it is unfit to ſupport fire or maintain life in animals; and that its ſpecific gravity is not much leſs than that of common air; ſo that though the nitrous acid, by being united to phlogiſton, is converted into air poſſeſſed of theſe properties; and, conſequently, though it was reaſonable to ſuppoſe, that part at leaſt of the phlogiſticated air of the atmoſphere conſiſts of this acid, united to phlogiſton; yet it might be fairly doubted whether the whole is of this kind, or whether there are not, in reality, many different ſubſtances confounded by us under the name of phlogiſticated air. I therefore made an experiment to determine whether the whole of a given portion of the atmoſphere could be reduced to nitrous acid, or whether there was not a part of a different nature from the reſt, which would refuſe to undergo that change. For this purpoſe, I diminiſhed a ſimilar mixture of dephlogiſticated and common air in the ſame manner as before, until it was reduced to a ſmall part of its original bulk; after which ſome dephlogiſticated air was added, and the ſpark continued until no further diminution took place. Having by theſe means condenſed as much as I could of the phlogiſticated air, I let up ſome ſolution of liver of ſulphur to abſorb the dephlogiſticated air; after which only a ſmall bubble of air remained unabſorbed, which certainly was not more than $\frac{1}{120}$th of the bulk of the phlogiſticated air let up into the tube; ſo that if there is any part of the phlogiſticated air of our atmoſphere which differs from the reſt, and cannot be reduced to nitrous acid, we may ſafely conclude, that it is not more than $\frac{1}{120}$th part of the whole."

Though theſe experiments had ſhown, that the chief cauſe of this diminution of airs is the converſion of the phlogiſticated kind into nitrous acid, it ſeemed not

105 Effects of the electric ſpark on dephlogiſticated air incloſed between different liquors.

not unlikely, that when any liquor containing inflammable matter was in contact with the air in the tube, ſome of this matter might be burnt by the ſpark, and thereby diminiſh the air. In order to determine this, the electric ſpark was paſſed through dephlogiſticated air included between different liquors; and the reſult of the experiments was, that when dephlogiſticated air, containing only $\frac{1}{20}$th part of its bulk of phlogiſticated air, was confined between ſhort columns of ſoap-leys, and the ſpark paſſed through it till no farther diminution could be perceived, the air loſt $\frac{43}{200}$ds of its bulk; which is not a greater diminution than might very likely proceed from the decompoſition of the ſmall quantity of phlogiſticated air contained in it, as the dephlogiſticated air might eaſily be mixed with a ſmall quantity of common air while putting into the tube. When the ſame dephlogiſticated air was confined between columns of diſtilled water, the diminution was rather greater than before, and a white powder was formed on the ſurface of the quickſilver beneath: the reaſon of which, in all probability, was, that the acid produced in the operation corroded the quickſilver, and formed the powder; and that the nitrous air produced by that corroſion united to the dephlogiſticated air, and cauſed a greater diminution than would otherwiſe have taken place. When a ſolution of litmus was uſed inſtead of diſtilled water, the ſolution ſoon acquired a red colour; which grew paler and paler as the ſpark was continued, till it became quite colourleſs and tranſparent. The air was diminiſhed by almoſt one-half, and might perhaps have been further diminiſhed had the ſpark been continued. When lime-water was let up into the tube, a cloud was formed, and the air was further diminiſhed by about one-fifth; the remainder was good dephlogiſticated air. In this experiment, therefore, the litmus was, if not burnt, at leaſt decompounded, ſo as to loſe entirely its purple colour, and to yield fixed air; ſo that, though ſoap-leys cannot be decompounded by this proceſs, yet the ſolution of litmus can, and ſo very likely might the ſolutions of many other ſubſtances be. But there is nothing in any of theſe experiments which favours the opinion of the air being at all diminiſhed by means of phlogiſton communicated to it by the electric ſpark.

SECT. V. *Of Fixed Air.*

106 Fixed air found in a great variety of ſubſtances.

THE diſcovery of this kind of air is as old as Van Helmont; who gave it the name of *gas ſilveſtre*, from its being emitted in great quantity by burning charcoal. Subſequent diſcoveries ſhowed, that a fluid of the ſame kind was plentifully produced by fermenting liquor, in almoſt every kind of combuſtion, and naturally generated in vaſt quantity in mines and coal-pits, where it is known by the name of the *choak-damp*; that in exiſts in a concrete ſtate in alkaline ſalts, chalk, limeſtone, the ſhells of marine animals, magneſia alba, &c. in a very large proportion, conſtituting one-half, and ſometimes more of their weight; and that it might always be extracted from the atmoſphere, in unlimited quantity, by expoſing certain ſubſtances to it.—On examining the nature of this fluid, it was found ſo manifeſtly acid, that it has now obtained a place among theſe ſubſtances under the name of *aërial acid*; or more improperly, *cretaceous acid*, from its being contained in great quantities in chalk, as has been already mentioned.

107 Specific gravity &c. of fixed air.

Fixed air is the heavieſt of all permanently elaſtic fluids, excepting thoſe derived from the mineral acids. Mr Kirwan determines it to be to common air as 1500 to 1000, the barometer being at 29.85, the thermometer at 64, and the fixed air being extracted from calcareous ſpar by marine acid, whoſe ſpecific gravity was 1.0145. He obſerves, however, that though this air was obtained in the drieſt manner poſſible, and that the globe which contained it appeared perfectly free from moiſture; yet, when carried into a room 27 degrees colder, the inſide of the globe was covered with dew, which ſoon formed viſible drops.—In its concrete ſtate, fixed air is one of the heavieſt bodies in nature. Mr Kirwan, in the 71ſt volume of the Philoſophical Tranſactions, gives an account of his ingenious method of finding the ſpecific gravity of fixed air in its fixed ſtate, when combined with calcareous earth; from which it appears, that fixed air, in that ſtate, is prodigiouſly concentrated, and, were it poſſible to exiſt by itſelf in that concentrated ſtate, it would be the heavieſt body known, gold and platina excepted.

Mr Kirwan firſt aſcertained the ſpecific gravity of a piece of white marble; then expelled the fixed air from a known weight of it finely powdered, by means of diluted vitriolic acid; the bulk and weight of the obtained fixed air being aſcertained. Next he calcined a known quantity of the ſame ſort of marble, by keeping it in a white heat for the ſpace of 14 hours; after which, being weighed again, and from the weight loſt by this calcination, the weight of the fixed air, which muſt have eſcaped from it according to the abovementioned experiment, being ſubtracted, the remainder is the weight of water contained in the marble; from which experiments it appears, that 100 grains of the marble contained 32.42 grains of fixed air, 11.66 grains of water, and 55.92 grains of pure calcareous earth.

"I next (ſays he) proceeded to diſcover the ſpecific gravity of the lime. Into a braſs box, which weighed 607.65 grains, and in the bottom of which a ſmall hole was drilled, I ſtuffed as much as poſſible of the finely-powdered lime, and then ſcrewed the cover on, and weighed it both in air and in water. When immerſed in this latter, a conſiderable quantity of common air was expelled: when this ceaſed, I weighed it. The reſult of this experiment was as follows:

	Grains.
Weight of the box in air - -	607.65
Its loſs of weight in water - -	73.75
Weight of the box and lime in air - -	1043.5
Weight of the lime ſingly in air - -	435.85
Loſs of weight of the box and lime in water -	256.5
Loſs of weight of the lime ſingly - -	182.3

"Hence, dividing the abſolute weight of the lime by its loſs in water, its ſpecific gravity was found to be 2.3908.

"From theſe data I deduced the ſpecific gravity of fixed air in its fixed ſtate; for 100 grains of marble conſiſt of 55.92 of earth, 32.42 of fixed air, and 11.66 of water; and the ſpecific gravity of the marble is 2.717. Now the ſpecific gravity of the fixed air, in its fixed ſtate, is as its abſolute weight, divided by its loſs of weight in water; and its loſs of weight in water is as the loſs of 100 grains of marble, *minus* the loſs of the pure calcareous earth and the water.

Loſs of 100 grs. of marble $= \frac{100}{2.717} = 36.8$ grs.

Loſs of 55.92 grs. of calcareous earth - - - $= \frac{55.92}{2.39} = 23.39$ grs.

Loſs of 11.66 grs. of water = - 11.66

$$\overline{35.05}$$

"Then the loſs of the fixed air $36.8 - 35.05 = 1.75$; conſequently its ſpecific gravity is $\frac{32.42}{1.75} = 18.52$."

108 Its other properties.

Fixed air differs conſiderably in its properties from the airs already mentioned. Its acidity is manifeſt to the taſte, and ſtill more from its neutraliſing both fixed and volatile alkalis; which it will do in ſuch a manner as not only to deſtroy their cauſticity, but to give them a manifeſtly acid taſte, and will moreover enable them to form cryſtals of a neutral or acidulous ſalt. It has a conſiderable antiſeptic power, and will even check the putrefaction of animal ſubſtances; though it has been obſerved, that in this caſe it acts only by abſorbing the putrid effluvia already emitted from the body and becomes itſelf very offenſive, while it ſweetens the other. When taken into the lungs, it is equally poiſonous with phlogiſticated or any other noxious air, and extinguiſhes flame as effectually; but, when mixed with dephlogiſticated air, may be inſpired without any danger, and even in its pure ſtate may be ſwallowed in large quantities, not only without danger, but with the moſt ſalutary effects in ſome diſeaſes, whence it has now become an article of the Materia Medica. As an acid it ſtands in the loweſt rank, being expelled from alkalis by every other; though it is capable of ſeparating oils, ſulphur, and the colouring matter of Pruſſian blue, from the ſubſtances with which they are combined.

109 Conſtituent principles of fixed air.

The origin of this acid was for a long time as much unknown as that of the others; and while the general prejudice remained that acids were a kind of primary elements unchangeable in their nature, it was ſuppoſed that fixed air was ſome modification of the others, probably the nitrous. But the diſcoveries made of late years, have abundantly ſhown, that the chemical principles are by no means ſo indeſtructible as they were imagined; and that the vegetable acids particularly, may be almoſt totally reſolved into fixed air. Hence it was naturally ſuggeſted, that fixed air itſelf might be a compound of ſome other principles; and it was ſuggeſted by Dr Black, that it was a combination of atmoſpherical air with phlogiſton. As the air of our atmoſphere, however, is compounded of two ſubſtances, one of which naturally contains no phlogiſton, and the other as much as it can hold: it ſeemed unlikely that there ſhould be any poſſibility of adding to the quantity of phlogiſton contained in a portion of the atmoſphere, without decompoſing it in ſome manner or other. Succeeding experiments evinced, that it was by a decompoſition of the pure part of atmoſpherical air, and a combination of the phlogiſton of the fuel with its baſis, that fixed air was produced; and this fact was evinced by numerous experiments made by Mr Kirwan, Mr Lavoiſier, and Dr Prieſtley, ſo that it is now looked upon to be generally eſtabliſhed: and as the experiments made by Dr Prieſtley appear fully as convincing as any, we ſhall here content ourſelves with giving an account of them.

110 Dr Prieſtley's experiments on the compoſition of fixed air.

The compound nature of fixed air, and the principles from which it is formed, were firſt diſcovered by Mr Kirwan; but Dr Prieſtley was not convinced by the proofs he adduced, till after making ſome experiments of his own. The firſt was, by firing ſhavings of iron in dephlogiſticated air; when he obſerved a conſiderable reſiduum of fixed air, though that in the receiver had been of the pureſt dephlogiſticated kind, and iron could only have yielded inflammable air. The hypotheſis of Mr Kirwan was ſtill further confirmed by an experiment in which iron-filings, which could only have yielded inflammable air, were mixed with red precipitate, which is known to yield only pure dephlogiſticated air. On heating theſe in a glaſs retort, they gave a great quantity of fixed air, in ſome portions of which nineteen-twentieths were abſorbed by lime-water, and the reſiduum was inflammable; but when the red precipitate was mixed with powdered charcoal, which had been found to yield only inflammable air, the fixed air produced from it was ſo pure that only one-fortieth part remained unabſorbed by water, which is as pure as that generally prepared from chalk and oil of vitriol. In ſome of theſe experiments it appeared, that three ounce-meaſures of dephlogiſticated air went to the compoſition of two of fixed air: for one ounce of red precipitate gave 60 ounce-meaſures of dephlogiſticated air; and, when mixed with two ounces of iron-filings, it gave about 40 ounce-meaſures of fixed air that were actually abſorbed by water, beſides a reſiduum that was inflammable. The ſame proportion was obtained when half the quantity of materials were made uſe of; but on uſing an ounce of each, only 20 ounce-meaſures of fixed air, including the reſiduum, could be got.

In conſidering this ſubject farther, it occurred to Dr Prieſtley, that his experiments, in which charcoal was uſed, lay open to an objection, that ſince dry wood, and imperfectly made charcoal, yield fixed air, it might be ſaid, that all the elements of fixed air are contained in charcoal; and though this ſubſtance alone, even with the aſſiſtance of water, will not yield fixed air, this might be effected by treating it with other ſubſtances without their imparting any thing to it; eſpecially as the inflammable air procured from charcoal by means of water, appears to contain fixed air when decompoſed with the dephlogiſticated kind. In order to expel all the fixed air from charcoal, he made a quantity of it from dry oak, and pounding it while hot, inſtantly mixed four meaſures of it with one of red precipitate, and, putting them into an earthen retort, got, with a heat no greater than what was ſufficient to revive the mercury, a large quantity of air, half of which was fixed. Afterwards the proportion of fixed air was leſs, and at laſt no fixed air at all was obtained; but as the reſiduum was worſe than the common atmoſphere, he is thence inclined to believe, notwithſtanding Mr Cavendiſh's experiments, that phlogiſticated air may be compoſed of phlogiſton and dephlogiſticated air.

111 Prieſtley's opinion concerning the compoſition of phlogiſticated air.

In another experiment he found a better proportion of charcoal and red precipitate. This was by mixing one ounce of precipitate with the ſame quantity of perfect charcoal hot from the retort in which it was made. Putting theſe into a coated retort, he expelled from them, by a ſtrong heat, about 30 ounce-meaſures of air, the whole of which was the pureſt fixed air, leaving only about one-fortieth part unabſorbed by water, and this almoſt perfectly phlogiſticated.

Having recollected, that in ſome former experiments he had obtained fixed air from nitrous acid and charcoal, he therefore repeated the experiment with ſome of the ſame charcoal which had then been made uſe of; when fixed air was obtained, in the quantity ſometimes only of one-fifth, and ſometimes one-half; to the formation of which he ſuppoſed the dephlogiſticated air produced by heating the nitrous acid muſt have contributed. On account of the objections, however, which might be made to the uſe of charcoal, he next employed *iron*, which was liable to nothing of this kind; and on mixing an ounce of iron-filings with as much charcoal, and then heating them in a glaſs retort, he obtained 20 ounce-meaſures of air, of which one-ſeventh remained unabſorbed by water. The reſiduum was of the ſtandard of 1.52, but ſlightly inflammable. Repeating the experiment with half an ounce of iron filings, he got 26 ounce-meaſures of air, of which the firſt part was pretty pure, but afterwards one-tenth remained unabſorbed by water; but on mixing one ounce of precipitate with two ounces of filings, he got about 40 ounce-meaſures of air, of the firſt portions of which only one-twentieth was unabſorbed by water, though towards the concluſion the reſiduum was greater. In this proceſs he got in all 36 ounce-meaſures of pure fixed air, completely abſorbed by water, beſides about other four ounce-meaſures, which, he ſuppoſes, might have been abſorbed in receiving the air and transferring it into other veſſels.

Fixed air was alſo produced from red precipitate mixed with braſs filings, with zinc, from turbith mineral with iron filings, and from the black powder into which mercury mixed with lead is eaſily converted. In this laſt caſe the Doctor ſuppoſes that the fixed air was produced from the dephlogiſticated kind abſorbed by the metals and the phlogiſton of the lead; and this is confirmed by an obſervation that the fixed air always comes firſt in the proceſs, when the phlogiſton is moſt readily ſeparated, but afterwards the produce becomes quite pure and dephlogiſticated. In attempting, however, to increaſe the quantity of fixed air by heating this black powder in dephlogiſticated air, he found only an augmentation of the quantity of dephlogiſticated air, and that of the pureſt kind.

"Perhaps," ſays he, "as deciſive a proof as any of the real production of fixed air from phlogiſton and dephlogiſticated air, may be drawn from the experiments in which I always found a quantity of it when I burned ſulphur in dephlogiſticated air. In one of theſe experiments, to which I gave particular attention, ſix ounce-meaſures and an half of the dephlogiſticated air were reduced to about two ounce-meaſures; and one-fifth of this was fixed air. When both the vitriolic acid and fixed air produced by this operation were abſorbed by water, the remainder was very pure dephlogiſticated air.

"I had always concluded, that no fixed air could be procured by the decompoſition of inflammable air which had been produced by mineral acids, becauſe I had not been able to do it with that which I had got by means of vitrolic acid; but I learned from Mr Metherie, that this is peculiar to the vitriolic acid, the remains of which, diffuſed through the inflammable air, procured by it, he conjectures, may actually decompoſe the fixed air produced in the proceſs. For, as I have hinted before, when the inflammable air is produced from iron by means of ſpirit of ſalt, there is a very perceivable quantity of fixed air when it is united with dephlogiſticated air. When I decompoſed theſe two kinds of air in equal quantities, they were reduced to about 0.5 of a meaſure, and of this not more than about one fortieth part was fixed air. This experiment ought, however, to be added to the other proofs of fixed air being produced by the union of dephlogiſticated air and phlogiſton.

112
Proportion of fixed air produced from dephlogiſticated air.

"The laſt inſtance, which I ſhall mention, of the generation of fixed air from phlogiſton and dephlogiſticated air, is of a much more ſtriking nature than any that I have yet recited. Having made what I call *charcoal of copper*, by paſſing the vapour of ſpirit of wine over copper when it was red-hot, I heated a piece of it in different kinds of air. In common air, obſerving neither increaſe nor decreaſe in the quantity, I concluded, perhaps too haſtily, that no change was made in it: for when I repeated the experiment in dephlogiſticated air, the charcoal burned very intenſely; and when a part of it was conſumed, which (like common charcoal in the ſame proceſs, was done without leaving any ſenſible reſiduum) I found that no heat which I could apply afterwards, had any farther effect on what was left of the charcoal. Concluding, therefore, that ſome change muſt be made in the quality of the air, I examined it, and found about nine-tenths to be the pureſt fixed air; and the reſiduum was ſuch as would have been made by ſeparating the abſolutely pure part of the dephlogiſticated air, leaving all the impurities behind.—Having aſcertained this fact, I repeated the experiment, weighing the piece of charcoal very carefully before and after the proceſs; and then found, that by the loſs of one grain of charcoal, I reduced four ounce-meaſures of dephlogiſticated air till one-ninth only remained unabſorbed by water; and again, with the loſs of one grain and an half of the charcoal, I reduced ſix and an half-meaſures of dephlogiſticated air till five and an half-meaſures were pure fixed air. In this proceſs there was a diminution of bulk after the experiment, as might have been expected from the change of the air into one of a heavier kind by means of a ſubſtance or principle that could not add much to the weight of it. In one of the experiments, 4.3 ounce-meaſures of dephlogiſticated air were reduced about one-thirtieth part of the whole; and in this caſe, when the fixed air was ſeparated by water, there was a reſiduum of 0.75 of the meaſure of the ſtandard of 1.0, whereas the dephlogiſticated air, before the experiment, had been of the ſtandard of 0.2.

"That dephlogiſticated air actually enters into the compoſition of the fixed air, in this experiment, is evident from the weight of the latter, which far exceeds that of the charcoal diſperſed in the proceſs. For, in this laſt experiment, the weight of the fixed air produced was 4.95 grains. Conſequently, ſuppoſing the charcoal to be wholly phlogiſton, as it is very nearly ſo, fixed air may be ſaid to conſiſt of 3.45 parts of dephlogiſticated air, and 1.5 of phlogiſton; ſo that the dephlogiſticated air is more than three times the proportion of phlogiſton in it.—I muſt not conclude, however, without obſerving, that, in one experiment, I never failed to produce fixed air; though it is not eaſy to ſee how *one* of its ſuppoſed elements, viz. dephlogiſticated air, could enter into it. This is by heating iron in vitriolic acid air. In one of theſe experiments, four ounce-meaſures of the vitriolic acid air were reduced to 0.65 of an ounce-meaſure; and of the quantity loſt three and a half meaſures were fixed air abſorbed by lime-water, and the remainder weakly inflammable."

113
Effects of the electric ſpark on fixed air.

Fixed air, even when pure and unmixed, is remarkably altered by the electric ſpark, part of it being thus rendered immiſcible in water. Dr Prieſtley, having taken the electric ſpark for about two hours in a ſmall quantity of fixed air confined by mercury, found, that after the operation one-fourth of it remained immiſcible with water; though, before it, only one-thirtieth part had remained unabſorbed. The inſide of the tube had become very black; which, in other experiments of a ſimilar kind with vitrolic acid air, he had obſerved to ariſe from the adheſion of a ſmall quantity of mercury ſuperſaturated with phlogiſton. In another experiment, in which the ſpark was taken an hour and ten minutes in about half an ounce-meaſure of fixed air, one-fifth remained unabſorbed, and the ſtandard of the reſiduum was 0.9; though, before the operation, only one-thirtieth part had been abſorbed, and the ſtandard of the reſiduum was 1.0. In this experiment, alſo, he obſerved, that the air was increaſed about a twentieth part. On taking the electric ſpark an hour in half an ounce of fixed air, as much reſiduum was left as had remained in five times the quantity of the ſame fixed air in which no ſpark had been taken. This reſiduum was alſo much purer than that of the original fixed air, the ſtandard being 0.8; whereas that of the original fixed air had been, as before, 1.0. On repeating the experiment, he found the reſiduum ſtill greater, but equally pure; and, in this caſe, a good quantity of black matter was obſerved adhering to the tube. Having taken the ſpark in a ſmall tube containing $\frac{1}{15}$th of an ounce-meaſure of fixed air, the inſide of the tube was clouded with black matter, and in the bottom was a ſmall quantity of yellowiſh matter reſembling ſulphur; the reſiduum was between one-fourth and one-fifth of the whole, and leſs pure than formerly. This circumſtance he alſo ſuppoſes to be a proof that fixed air may be compoſed of phlogiſton and dephlogiſticated air. Purſuing this experiment, by taking the electric ſpark three hours in a ſmall quantity of fixed air, he obſerved that it was firſt increaſed, and then diminiſhed about one-eighth of the whole; the inſide of the tube being very black on the upper part, and below the mercury very yellow, for the ſpace of a quarter of an inch all round the tube; but this ſpace had been above the mercury in the beginning of the operation. One-third of the air remained unabſorbed by water; but ſo impure, that the ſtandard of it was 1.8, or almoſt completely phlogiſticated.—Varying the proceſs by uſing water impregnated with fixed air inſtead of mercury, the quantity of air was much augmented by that which came from the water; but thus the far greater part of it was incapable of being abſorbed by lime-water; and on this occaſion he obſerved, that water impregnated with fixed air is a much worſe conductor of electricity than the ſame fluid impregnated with mineral acids. On ſtill varying the circumſtances of the experiment, by uſing common water inſtead of that which had abſorbed fixed air, he found that the quality of the reſiduum was evidently better than that of the original fixed air.

114
Experiment in favour of Prieſtley's hypotheſis concerning the compoſition of phlogiſticated air.

115
Effects of a ſtrong heat on fixed air.

In order to diſcover whether the heat or light of the electric ſpark were the circumſtances which effected the change, the Doctor threw a ſtrong light, by means of a lens, for ſome hours, on a quantity of pounded glaſs confined in ſome fixed air; but though the volume of reſiduum was thus ſomewhat increaſed, yet as it was of the ſame quality with common air, he ſuſpected that it might be only that portion which had been introduced among the particles of the glaſs. The quantity of air was increaſed after the operation. With glaſs-houſe ſand made very hot, the quantity of air was likewiſe increaſed; but the experiment was not more ſatisfactory than the former. Heated bits of crucibles increaſed the quantity of reſiduum in the proportion of 10 to 6.6; but the quality was injured either directly by a compariſon with nitrous air, or by producing a larger quantity of reſiduum equally bad. By heating iron, however, in fixed air, part of it was evidently converted into phlogiſticated air. On heating turnings of malleable iron for ſome time in fixed air, one-tenth part of it was rendered immiſcible with water; and on repeating the proceſs with the remainder, there was a reſiduum of one-fourth of the whole. There was alſo a ſmall addition to the quantity of air after the firſt part of the proceſs, but none after the ſecond; nor could he, after a third and fourth proceſs, render more than one-fourth immiſcible with water. In two experiments, the reſiduum was inflammable, and burned with a blue flame.

116
Quantity of fixed air expelled from different ſubſtances.

With regard to the quantity of fixed air which may be expelled from different ſubſtances, Dr Prieſtley obſerves, that from ſeven ounces of whiting, the pureſt calcareous ſubſtance we are acquainted with, he expelled by heat 630 ounce-meaſures of air; by which means the whiting was reduced to four ounces. One third of this was ſomewhat phlogiſticated; the ſtandard being 1.36 and 1.38. Repeating the experiment, he obtained 440 ounce-meaſures of air from ſix ounces of whiting; about one-half of which was fixed air, and the remainder of the ſtandard of 1.4. On moiſtening ſome calcined whiting with water impregnated with vitriolic acid air, he obtained 90 ounce-meaſures; of which the firſt portions were three-fourths fixed air, and the ſtandard of the reſiduum 1.5; the latter had leſs fixed air, and the ſtandard of the reſiduum was 1.44. The whiting was rendered black and hard, but became ſoft and white with ſpirit of ſalt. Three ounces and a quarter of lime fallen in the air, yielded 375 ounce-meaſures; of which about one-fifth was fixed air, and the ſtandard of the reſiduum 1.4. Four ounces of white lead had yielded 240 meaſures of air when the retort melted. The reſiduum of the firſt proceſs was one-third, the ſtandard 1.36; and of the laſt the ſtandard was 1.28, that with the common atmoſphere being 1.23. Two ounces and three quarters of wood-aſhes yielded, in a very ſtrong heat, 430 ounce-meaſures of air; of the firſt portion of which one-tenth, of the ſecond one-third, and of the third one-half, was fixed air. The ſtandard of the reſiduum of the firſt portion was 1.6, and of the ſecond 1.7. It extinguiſhed a candle; ſo that the air came properly from the aſhes, and not from any remaining particles of the charcoal mixed with them. After the proceſs, the aſhes weighed 839 grains; but by expoſure to the air for one day, the weight was increaſed to 842 grains; and, perhaps with more heat than before, yielded 50 ounce-meaſures of air; of which about one-eighth was fixed air, and the ſtandard of the reſiduum 1.38 and 1.41. A candle burned in this reſiduum, and the aſhes were reduced to 789½ grains. Two ounce-meaſures of Homberg's pyrophorus burned in the open air, and then diſtilled in a retort, yielded 144 ounce-meaſures of air; of which one-half at firſt was fixed air, but at the laſt very little. The reſiduum of the firſt portion extinguiſhed a candle, but that of the laſt burned with a blue lambent flame. The ſtandards of both with nitrous air were about 1.8. The pyrophorus was then kept two days in the retort, with the mouth immerſed in mercury; after which, on being taken out, it burned as ſtrong as ever. Immediately before the burning, it weighed 428 grains; immediately after it, 449: but being ſpread thin and expoſed to the atmoſphere for a night, the weight was increaſed to 828 grains; though, on being well dried, it was again reduced to 486. Subjecting it to a greater heat than before, the matter yielded 110 ounce-meaſures of air; the firſt portions of which were half-fixed air, but the laſt contained very little, and burned with a blue lambent flame. It was then reduced to 396 grains. The experiment was then repeated with a quantity of pyrophorus, which would not take fire in the open air; and on heating this ſubſtance in an earthen retort, five-ſevenths of the firſt part of the produce was fixed air; but this proportion gradually diminiſhed; till at laſt nine-tenths of the whole was inflammable air, burning with a lambent blue flame. This inflammable air being decompoſed with an equal quantity of dephlogiſticated air, yielded 0.86 of a meaſure of fixed air. Another quantity of pyrophorus, which burned very well, and which, by expoſure to the atmoſphere, had gained 132 grains, being again expoſed to heat in an earthen retort, gave 180 ounce-meaſures of air; three-ſevenths of the firſt portion of which was fixed, and the reſt phlogiſticated air; but afterwards only one-half was fixed and the reſt inflammable, burning with a lambent blue flame; and at laſt it was wholly inflammable. This pyrophorus took fire again after being poured out of the retort, but not without the aſſiſtance of external heat. It had been red-hot through the whole maſs at the firſt burning, and the ſurface was covered with white aſhes; but all the inſide was as black as ever it had been. Four ounces of dry ox-blood yielded 1200 ounce-meaſures of air, and it was conjectured that not leſs than 200 meaſures had eſcaped. It contained no fixed air. The firſt portion burned with a large lambent white flame, the middle portion fainter, and the laſt was hardly inflammable at all. The remaining coal weighed 255 grains, and was a good conductor of electricity.

SECT. VI. *Inflammable Air.*

WE owe the knowledge of the exiſtence, and of ſome remarkable properties, of this air, to Mr Cavendiſh, by whom they were firſt publiſhed in 1767. Its effects, however, had long before been fatally experienced by miners; in whoſe ſubterraneous habitations it is often collected in ſuch quantities as to produce the moſt dreadful effects. It is produced in abundance from putrid animal and vegetable ſubſtances; and, in general, by all thoſe which part with their phlogiſton eaſily. Being much lighter than common air, it always riſes to the top of thoſe places where it is generated; ſo that it cannot be confined except in ſome vaulted place, but always ſtrives to aſcend and mix with the atmoſphere. By itſelf it is very noxious, and will inſtantly put an end to animal life; but when mixed with atmoſpherical air, may be breathed in much greater quantity than fixed air. Its great inflammability in this ſtate, however, renders it very dangerous to bring any lights, or even to ſtrike a flint with ſteel, in thoſe places where it abounds. But this only takes place when the inflammable air is mixed with common atmoſpherical or with dephlogiſticated air; in which caſe, the exploſion is much more violent than the former; for pure inflammable air extinguiſhes flame as effectually as fixed or phlogiſticated air.

117 Inflammable air produced in mines from putrid waters, &c.

Beſides the ſubterraneous places already mentioned, this kind of air is found in ditches; over the ſurface of putrid waters, out of which it eſcapes; in burying-places; in houſes of office, where putrid animal and vegetable matters are accumulated; and may, by ſtanding or boiling, be extracted from the waters of moſt lakes and rivers, eſpecially thoſe in which great quantities of fermenting and putrifying matters are thrown: and as putrefaction thus ſeems to be the principal ſource of inflammable air, it thence happens, that much more of it is produced in warm than in cold climates. In thoſe countries, we are informed by Dr Franklin, that if the mud at the bottom of a pond be well ſtirred, and a lighted candle brought near to the ſurface of the water immediately after, a flame will inſtantly ſpread a conſiderable way over the water, from the accenſion of the inflammable air, affording a very curious ſpectacle in the night-time. In colder climates, the generation of inflammable air is not ſo plentiful as to produce this phenomenon; nevertheleſs Mr Cavallo informs us, that it may be plentifully procured in the following manner, in all the ponds about London. "Fill a wide-mouthed bottle with the water of the pond, and keep it inverted therein; then, with a ſtick, ſtir the mud at the bottom of the pond, juſt under the inverted bottle, ſo as to let the bubbles of air which come out of it enter into the bottle; which air is inflammable. When by thus ſtirring the mud in various places, and catching the air in the bottle until it is filled, a cork or glaſs ſtopper muſt be put over it whilſt ſtanding in water; and then the bottle may be taken home, in order to examine the contained inflammable fluid at leiſure."

118 Great quantities produced in hot climates.

119 Mr Cavallo's method of collecting inflammable air from ponds

120 Meteors thought to proceed from it.

The great quantity of inflammable air produced in warm climates has given occaſion to ſome philoſophers to ſuppoſe, that it may poſſibly have ſome ſhare in producing certain atmoſpherical meteors. The weak lightenings without any exploſion, which are ſometimes perceived near the horizon in ſerene weather, are by them conjectured to proceed from inflammable air fired by electric exploſions in the atmoſphere. Mr Volta ſuppoſes that the *ignes fatui* are occaſioned by the inflammable air which proceeds from marſhy grounds, and is ſet on fire by electric ſparks: but theſe phenomena can be accounted for in a more probable manner from the action of the electric fluid itſelf.

121
Differences among inflammable airs.

This kind of air is more common than any of the other noxious airs; for there is hardly any inflammable ſubſtance on earth, out of which it may not be extracted by one means or other. The fluids, however, which go by the general name of *inflammable air*, have ſcarce any other property in common to them all, beſides thoſe of inflammability, and being ſuperficially lighter than the common atmoſpherical air. In other reſpects, the differences between them are very conſiderable. The ſmell, weight, power of burning, of preſerving their properties, and the phenomena attending their combuſtion, are by no means the ſame in them all; ſome burning in an exploſive manner; others quietly, and with a lambent flame of a white or blue colour. It is, however, neceſſary to make a proper diſtinction between an inflammable elaſtic fluid or inflammable gas, which may be properly called ſo, and that which is evidently made by combining an inflammable ſubſtance with common air; which being eaſily ſeparable from the air, leaves that fluid in the ſtate it was before. Thus a drop of ether, put into a quantity of common air, mixes itſelf with it, and takes fire on the approach of flame, like a mixture of inflammable and common air; but if the air to which ether is added be waſhed in water, the latter is ſoon ſeparated from it. Common air becomes alſo inflammable by being tranſmitted through ſeveral eſſential oils; and thus the air contiguous to the plant called *fraxinella* becomes inflammable in calm and hot weather, by the emiſſion of its inflammable air.

122
Extracted from various ſubſtances by heat.

By heat alone, a conſiderable quantity of this kind of air may be extracted from moſt inflammable ſubſtances, and even from ſome of the metals. Dr Hales obtained inflammable air by ſimply diſtilling wax, pitch, amber, coals, peaſe, and oyſter ſhells; and Mr Fontana informs us, that he obtained a conſiderable quantity of inflammable air from ſpathoſe iron, by the action of fire only applied to it in a matraſs. Dr Prieſtley, however, obtained it from a vaſt number of other ſubſtances, by diſtilling them in a gun-barrel; to the extremity of which was luted a tobacco-pipe, or ſmall glaſs tube, with a flaccid bladder tied on the end. He obſerves, that the heat muſt be ſuddenly applied, in order to get a conſiderable quantity of air from theſe ſubſtances. "Notwithſtanding (ſays he) the ſame care be taken in luting, and in every other reſpect, ſix, or even ten, times more air may be got by a ſudden heat than by a ſlow one, though the heat that is laſt applied be as intenſe as that which was applied ſuddenly. A bit of dry oak, weighing about twelve grains, will generally yield a ſheep's bladder full of inflammable air with a briſk heat, when it will only yield two or three ounce-meaſures if the ſame heat be applied gradually." When he wanted to extract inflammable air from metals, a glaſs was uſed, the focus of which afforded a more intenſe heat than any furnace he could apply: and in this way he obtained inflammable air from ſeveral metals; as iron, braſs, and tin: but with the metallic calces he had no ſucceſs.

123
More air procured by a ſudden than gradual heat.

124
How procured from water and other fluid and ſolid ſubſtances.

In the infancy of his experiments, and even after very conſiderable practice, the Doctor imagined, that the inflammable air produced in this way came only from the metal, without attending to the ſhare which water had in the production. Some late experiments of Mr Lavoiſier, however, ſhowed, that water had a great ſhare in the production of inflammable air; inſomuch that it gave occaſion to a ſuppoſition, that the water was the only ſource from whence it was derived. This miſtake, however, was detected by Dr Prieſtley; who, by his numerous and accurate experiments, ſeems in a manner to have exhauſted the ſubject. The method which Mr Lavoiſier had followed, was to ſend the ſteam of boiling water through a red-hot iron tube; in doing which the intenſe heat acquired by the water occaſioned the production of a great quantity of inflammable air. Dr Prieſtley repeated his experiments not only with water, but with other fluids. Sending the vapour of two ounces of ſpirit of wine through a red-hot earthen tube, he obtained 1900 ounce-meaſures of inflammable air, which burned with a white lambent flame. It contained no fixed air; and 30 ounce-meaſures of it weighed eight grains leſs than an equal quantity of common air. He collected alſo 0.35 of an ounce-meaſure of water. In this experiment, the weight of the water collected was 168 grains, of the inflammable air 633 grains, and that of the ſpirit of wine originally was 821 grains, ſo that as little was loſt in the proceſs as could be expected.—Repeating the experiment with vitriolic ether, an ounce of it treated in the ſame manner in an earthen tube almoſt filled with pieces of broken earthen retorts and crucibles, one tenth part of an ounce of water was collected, and 740 ounce-meaſures of inflammable air were procured, without any mixture of fixed air, burning with a white lambent flame like that of wood, and not exploding with dephlogiſticated air. Twenty-nine ounce-meaſures of this weighed five grains leſs than an equal quantity of common air. Vapour of ſpirit of turpentine yielded inflammable air mixed with much black ſmoke, which ſoon collected on the ſurface of the water in the receiver. The ſmell of this air was exceedingly offenſive, and its flame was much leſs luminous than that of the former. Its ſpecific gravity was the ſame with that of the air procured from ſpirit of wine. Olive oil yielded a conſiderable quantity of air on being mixed with calcined whiting, the firſt portions burning with a large white flame, and the laſt with a lambent blue one.

In extracting air from ſolid ſubſtances, the ſteam of water was always neceſſary; and thus inflammable air was produced from a great number of different ones. From ſulphur treated in this manner in an earthen tube, inflammable air was obtained of a nature ſimilar to that from oil of vitriol and iron. From arſenic, the produce was one-ſeventh of fixed air; but all the reſt ſtrongly inflammable, with a ſmell ſcarcely diſtinguiſhable from that of phoſphorus. Twenty ounce-meaſures of this air weighed $4\frac{1}{2}$ grains leſs than an equal quantity of common air. Both theſe experiments, however, were very troubleſome, on account of the volatility of the matters, which ſublimed and choaked up the tubes. From two ounces of the ſcales of iron, or *fining cinder*, which he has found to be the ſame thing, Dr Prieſtley obtained 580 ounce-meaſures of air; one-tenth of the firſt part of which was fixed air, but afterwards it was all inflammable.

Forty ounce-meaſures of this air weighed two grains more than an equal quantity of common air. From charcoal expoſed to the red hot ſteam of water, inflammable air was procured in great quantities. From ninety-four grains of perfect charcoal, that is, prepared with a ſtrong heat ſo as to expel all fixed air from it, and 240 ounces of water, 840 ounce-meaſures of air were obtained, one-fifth part of which was fixed air; and the inflammable part appeared likewiſe, by decompoſition, to have a quantity of fixed air intimately combined with it.—Three ounces of bones burnt black, and treated in this manner in a copper tube, yielded 840 ounce-meaſures of air; the water expanded being 288 grains, and the bones loſing 110 grains of their weight. This air, he obſerves, differs conſiderably from that of any other kind of inflammable air; being in ſeveral reſpects a medium betwixt the air procured from charcoal and that from iron. It contains about one-fourth of its bulk of uncombined fixed air, but not quite one-tenth intimately combined with the remainder. The water that came over was blue, and pretty ſtrongly alkaline; owing to the volatile alkali not having been totally expelled by the heat which had reduced the bones to blackneſs.

A variety of ſubſtances, ſaid not to contain any phlogiſton, were ſubjected to the ſame proceſs, but without yielding any inflammable air. The experiments with iron, however, were the moſt ſatisfactory, as being ſubject to leſs variation than thoſe with charcoal; and clearly evincing, that the air in the proceſs does not come from the water alone, but from the iron alſo; or, as Dr Prieſtley ſays, "only from the iron; the weight of water expended, deducting the weight of air produced, being found in the addition of weight in the iron as nearly as could be expected in experiments of this kind. And though the inflammable air procured in this proceſs is between one-third and one-half more than can be procured from iron by ſolution in acids, the reaſon may be, that much phlogiſton is retained in the ſolutions; and therefore much more may be expelled from iron when pure water, without any acid, takes place of it. The produce of air, and likewiſe the addition of weight gained by the iron, are alſo much more eaſily aſcertained in theſe experiments than the quantity of water expended in them; on account of the great length of the veſſels uſed in the proceſs, and the different quantities that may perhaps be retained in the worm of the tube."

125 Proportions of inflammable air obtained from iron by means of ſteam.

The following are the reſults of ſome of the Doctor's experiments.——Two hundred and ſixty-ſeven grains, added to the weight of a quantity of iron, produced a loſs of 336 grains of water, and an emiſſion of 840 ounce-meaſures of air; and in another experiment, 140 grains added to the weight of the iron produced a loſs of 240 grains of water, and the emiſſion of 420 ounce-meaſures of air. "The inflammable air produced in this manner (ſays he) is of the lighteſt kind, and free from that very offenſive ſmell which is generally occaſioned by the rapid ſolution of metals in oil of vitriol; and it is extricated in as little time in this way as it is poſſible to do it by any mode of ſolution. The following experiment was made with a view to aſcertain the quantity of inflammable air that may be procured in this manner from any given quantity of iron. Nine hundred and ſixty grains of iron, when diſſolved in acids, will yield about 800 ounce-meaſures of air; but, treated in this manner, it yielded 1054 meaſures, and then the iron had gained 329 grains in weight." (A).

126 Of the conſtituent principles of inflammable air.

Inflammable air having been at firſt produced only from metals by means of acids, it was then ſuppoſed that part of the acid neceſſarily enters into its compoſition; but this hypotheſis is now found to be ill grounded. "That no acid (ſays Dr Prieſtley), is neceſſarily contained, or at leaſt in any ſenſible quantity, either in inflammable air, though produced by means of acids, or in the dephlogiſticated air of the atmoſphere, is evident from the following experiment, which I made with the greateſt care: Taking a baſon which contained a ſmall quantity of water tinged blue with the juice of turnſole, I placed it in a bent tube of glaſs, which came from a veſſel containing iron and diluted oil of vitriol; and lighting the current of inflammable air as it iſſued from this tube, ſo that it burned exactly like a candle, I placed over it an inverted glaſs jar, ſo that the mouth of it was plunged in the liquor. Under this jar the inflammable air burned as long as it could; and when extinguiſhed for want of more pure air, I ſuffered the liquor to riſe as high as it could within the jar, that it might imbibe whatever ſhould be depoſited from the decompoſition of either of the two kinds of air. I then took off the jar, changed the air in it, and, lighting the ſtream of inflammable air, replaced the jar as before. This I did till I had decompoſed a very great quantity of the two kinds of air, without perceiving the leaſt change in the colour of the liquor, which muſt have been the caſe if any acid had entered as a neceſſary conſtituent part into either of the two kinds of air. I alſo found no acid whatever in the water, which was procured by keeping a ſtream of inflammable air conſtantly burning in a large glaſs balloon, through which the air could circulate, ſo that the flame did not go out. Neither was there any acid produced in the decompoſition of inflammable and dephlogiſticated air in a ſtrong cloſe glaſs veſſel.

127 No acid contained in it.

"With reſpect to inflammable air, I have obſerved, that when ſufficient care is taken to free it from any acid vapour that may be accidentally contained in it, it is not in the ſmalleſt degree affected by a mixture of alkaline air. On the whole, therefore, I have at preſent no doubt, but that pure inflammable air, though it certainly contains *water*, does not neceſſarily contain any

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(A) In theſe experiments, the Doctor ſeems not to have ſuppoſed that any particular kind of water was neceſſary for this production of inflammable air: but in the Memoirs of the Philoſophical Society at Haerlem, it is aſſerted by Dr Deiman and M. Paets Van Trooſtwyk, that the experiment will not ſucceed when boiled or diſtilled water, or any other than that containing fixed air, is made uſe of; and to this air they attribute the calcination of the iron and production of inflammable air. This aſſertion, however, is contrary to what we find related by Mr Kirwan. See n° 138.

any acid: yet an acid vapour may be eaſily diffuſed through it, and may perhaps in many caſes be obſtinately retained by it, as no kind of air ſeems to be capable of ſo great a variety of impregnations as inflammable air is."

128 Water neceſſary to its production.

Mr Cavendiſh firſt perceived the neceſſity of moiſture to the production of inflammable air; but it was not until after making ſeveral experiments that Dr Prieſtley could adopt the ſame idea. He had obſerved ſome very remarkable circumſtances relating to the production of inflammable air from charcoal, by which he was induced to ſuppoſe that the former was pure phlogiſton in a volatile ſtate without any moiſture whatever. The Dr obſerves, that "charcoal is generally ſaid to be indeſtructible, except by a red heat in contact with air. But I find (ſays he), that it is perfectly deſtructible, or decompoſed, *iu vacuo*, and, by the heat of a burning lens, almoſt convertible into inflammable air; ſo that nothing remains beſides an exceedingly ſmall quantity of white aſhes, which are ſeldom viſible, except when in very ſmall particles they happen to croſs the ſun-beams as they fly about the receiver. It would be impoſſible to collect or weigh them; but, according to appearance, the aſhes thus produced, from many pounds of wood, could not be ſuppoſed to weigh a grain. The great weight of aſhes produced by burning wood in open air ariſes from what is attracted by them from the air. The air which I get in this manner is wholly inflammable, without the leaſt particle of fixed air in it. But in order to this, the charcoal muſt be perfectly well made, or with ſuch a heat as would expel all the fixed air which the wood contains; and it muſt be continued till it yield inflammable air only, which, in an earthen retort, is ſoon produced.

129 Charcoal totally convertible into inflammable air.

130 Weight of aſhes derived from the air.

"Wood or charcoal is even perfectly deſtructible, that is, reſolvable into inflammable air, in a good earthen retort, and a fire that would about melt iron. In theſe circumſtances, after all the fixed air had come over, I ſeveral times continued the proceſs during a whole day; in all which time inflammable air has been produced equably, and without any appearance of a termination. Nor did I wonder at this, after ſeeing it wholly vaniſh into inflammable air *in vacuo*. A quantity of charcoal made from oak, and weighing about an ounce, generally gave me about five ounce-meaſures of inflammable air in twelve minutes."

131 Experiment ſhowing the neceſſity of water to the production of inflammable air.

Although from theſe experiments it did not appear that water was in any way eſſentially neceſſary to the production of this kind of inflammable air, it appeared manifeſtly to be ſo in the following: "At the time (ſays he) when I diſperſed any quantity of charcoal with a burning lens *in vacuo*, and thereby filled my receiver with nothing but inflammable air, I had no ſuſpicion that the wet leather on which my receiver ſtood could have any influence in the caſe, while the piece of charcoal was ſubject to the intenſe heat of the lens, and placed ſeveral inches above the leather. I had alſo procured inflammable air from charcoal in a glazed earthen retort for two whole days ſucceſſively, during which it continued to yield it without intermiſſion. Alſo iron-filings in a gun-barrel, and a gun-barrel itſelf, had always given inflammable air whenever I tried the experiment. Theſe circumſtances, however, deceived me, and perhaps would have deceived any other perſon; for I did not know, and could not have believed, the powerful attraction between water and charcoal or iron, when the latter are intenſely hot. They will find, and attract it, in the midſt of the hotteſt fire, and through any pores that may be left open in a retort; and iron-filings are ſeldom ſo dry as not to have as much moiſture adhering to them as is capable of enabling them to give a conſiderable quantity of inflammable air. But my attention being now fully awakened to the ſubject, I preſently found that the circumſtances above mentioned had actually miſled me; I mean with reſpect to the concluſion which I drew from the experiments, and not with reſpect to the experiments themſelves, every one of which will, I doubt not, be found to anſwer, when properly tried.

132 Exceſſive attraction betwixt charcoal, or iron and water.

"Being thus appriſed of the influence of unperceived moiſture in the production of inflammable air, and willing to aſcertain it to my perfect ſatisfaction, I began with filling a gun-barrel with iron-filings in their common ſtate, without taking any particular precaution to dry them, and I found that they gave air as they had been uſed to do, and continued to do ſo many hours: I even got ten ounce-meaſures of inflammable air from two ounces of iron-filings in a coated glaſs retort: At length, however, the production of inflammable air from the gun-barrel ceaſed; but, on putting water to it, the air was produced again; and a few repetitions of the experiment convinced me that I had been too precipitate in concluding that inflammable air is a pure phlogiſton. I then repeated the experiment with the charcoal, making the receiver the ſtand on which I placed the charcoal, and the charcoal itſelf, as dry and hot as poſſible, and uſing cement inſtead of wet leather, in order to exclude the air. In theſe circumſtances I was not able, with the advantage of a good ſun and an excellent burning lens, to decompoſe quite ſo much as two grains of the piece of charcoal, which gave me ten ounce-meaſures of inflammable air; and this, I imagine, was effected by means of ſo much moiſture as was depoſited from the air in its ſtate of rarifaction, and before it could be drawn from the receiver. To the production of this kind of inflammable air, therefore, I was now convinced that water is as eſſential as to that from iron."

133 Inflammable air is not pure phlogiſton.

134 Prieſtley's analyſis of different kinds of inflammable air.

In his analyſis of different kinds of inflammable air, the Doctor obſerves, that the difference moſt commonly perceived is, that ſome of them burn with a lambent flame, ſometimes white, ſometimes yellow, and ſometimes blue; while another kind always burns with an exploſion, making more or leſs of a report when a lighted candle is dipped into a jar filled with it. The inflammable air extracted from metals by means of acids is of this laſt kind; and that from wood, coal, or other inflammable ſubſtances by means of heat, belongs to the former. It has alſo been obſerved, that theſe kinds of inflammable air have different ſpecific gravities; the pureſt, or that which is extracted from iron, &c. being about ten times as light as common air; but ſome of the other kinds not more than twice as light (A).

This difference was for ſome time attributed to a quantity

(A) Here the Doctor's calculation differs ſomewhat from that of Mr Kirwan; who, in his Treatiſe on Phlogiſton, quantity of fixed air intimately combined with the heavier kinds, ſo that it could not be diſcovered by lime-water, while the lighteſt contained no fixed air at all. In order to aſcertain this point, he had recourſe to decompoſition; which was performed by mixing with the inflammable air to be tried an equal quantity of common or dephlogiſticated air, and then confining them in a ſtrong glaſs veſſel previouſly filled either with water or mercury; making afterwards an electric ſpark in ſome part of the mixture by means of wires inſerted through the ſides of the veſſel, and nearly meeting within it. Thus he ſuppoſed that he might be able to determine the quantity of *combined* fixed air, and likewiſe the relative quantity of phlogiſton contained in each of them. The former appeared by waſhing the air with lime-water after the exploſion, and obſerving how much of them was abſorbed; and the latter by examining the reſiduum with the teſt of nitrous air, and obſerving the purity of it. Finding, however, that, in ſome caſes, more fixed air was found after the exploſion than could have been *contained* in the inflammable air, he was thence led to obſerve the *generation* of fixed air from the principles mentioned in the laſt ſection.

135 Fixed air generated in the decompoſition of inflammable air.

In proſecuting this ſubject, it was found, that one meaſure of inflammable air produced by ſteam from metals, and one of dephlogiſticated air, ſuch as by mixture with two meaſures of nitrous air was reduced to 0.72 of a meaſure, were reduced by exploſion to 0.6 of a meaſure; the reſiduum, by an equal quantity of nitrous air, was reduced to 0.87. With the ſame dephlogiſticated air, the inflammable air from fining-cinder and charcoal was reduced only to 1.85 of a meaſure; but by waſhing in lime-water, to 1.2. The reſiduum examined by nitrous air appeared to be of the ſtandard of 0.9. In another proceſs, the diminution after the exploſion was to 1.55, and that after waſhing in lime-water to 0.65, of a meaſure; in a third, by exploſion to 1.6, and by waſhing to 0.66; and in a fourth, the firſt diminution was to 1.6, and the ſecond to 0.9. In this laſt experiment there was a generation of an entire meaſure of fixed air: and that this had not been contained originally in any latent ſtate in the original fluid, was evident from the ſpecific gravity of the inflammable air made uſe of. This, indeed, was one of the heavieſt kinds of the fluid: but 40 ounce-meaſures of it weighed only two grains more than an equal bulk of common air; whereas, had all the fixed air found in the reſiduum been *contained* in the original air, it muſt have been at leaſt one-half heavier. "Indeed (ſays the Doctor) if any quantity of inflammable air, of about the ſame ſpecific gravity with common air (which is the caſe with that ſpecies of it I am now conſidering), yield ſo much as ſeven-tenths of its bulk of fixed air in conſequence of its exploſion with dephlogiſticated air, it is a proof that at leaſt part of that fixed air was generated in the proceſs, becauſe ſeven-tenths of ſuch fixed air would weigh more than the whole meaſure of inflammable air."

Equal parts of dephlogiſticated air and the inflammable kind produced from ſpirit of wine, were reduced to one meaſure, and by waſhing in lime-water to 0.6 of a meaſure. The ſtandard of the reſiduum was 1.7.—In another experiment, in which the vapour of the ſpirit of wine had paſſed through a tube filled with bits of crucibles, the firſt diminution was to 1.6, the ſecond to 1.4, and the ſtandard of the reſiduum was to 1.84: but in a third, the firſt diminution was to 1.2, the ſecond to 0.9—Air procured by ſteam from red-hot platina was reduced to 0.72 of a meaſure, and the ſtandard of the reſiduum was 0.9. It contained no fixed air.—Air from brimſtone, with an equal part of dephlogiſticated air, was diminiſhed to 0.6, and no fixed air was found in the reſiduum. Its ſtandard was 0.95.—With inflammable air from arſenic, the firſt reduction was to 1.15, the ſecond to 0.95. The ſtandard was 0.82.—With the inflammable air procured by a decompoſition of alkaline air, the diminution by exploſion was to 0.96, and no fixed air was contained in the reſiduum; the ſtandard of which was 0.8.—Inflammable air from ether reſembles that from ſpirit of wine. The firſt diminution was to 1.36, the ſecond to 1.2; and the ſtandard was 1.9.

Inflammable air procured by means of ſteam from charcoal of metals produces a conſiderable quantity of fixed air; the firſt diminution being to 1.12, the ſecond to 0.8, and the ſtandard of the reſiduum 1.9. The analyſis was of the firſt portion that came over, the ſecond was ſomewhat different; the firſt diminution being to 1.0, the ſecond to 0.75, and the ſtandard of the reſiduum 1.9.—From *coak*, or the charcoal of pitcoal, the firſt diminution was to 1.15, the ſecond to 0.95, and the ſtandard 1.9; but the dephlogiſticated air in this experiment was by no means pure.

With inflammable air from ſpirit of turpentine, the firſt diminution was to 1.7, the ſecond to 1.6, and the ſtandard 1.9—From bones, the firſt diminution was to 0.67, the ſecond to 0.58; the ſtandard 1.47.—From common charcoal, the firſt diminution was to 1.5, the ſecond to 0.74, and the ſtandard 1.7. In another experiment, the firſt diminution was to 0.82, the ſecond to 0.63, and the ſtandard of the reſiduum 1.37.

Inflammable air procured by diſtilling ſome rich mould in a gun-barrel had a very offenſive ſmell, like that procured from putrid vegetables; it contained one-twentieth part of uncombined fixed air. When this was ſeparated from it, and the remainder decompoſed with dephlogiſticated air, the firſt diminution was to 1.4, the ſecond to 0.67, and the ſtandard of the reſiduum was 0.6.—The air procured from caſt-iron has likewiſe a peculiarly offenſive ſmell; and, on this account, the Doctor imagined, that it might contain more phlogiſton than common inflammable air, ſo as to abſorb more dephlogiſticated air than the other. But this conjecture did not appear to be well founded; for on exploding it with dephlogiſticated air in the proportions

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giſton, informs us, that in his experiments he uſed "inflammable air extracted from clean newly-made filings of ſoft iron, in the temperature of 59°, by vitriolic acid whoſe ſpecific gravity was, 1.0973, and obtained over mercury, having very little ſmell, and what it had being very unlike the uſual ſmell of inflammable air."—The weight of this air, when the barometer ſtood at 29.9, and the thermometer at 60°, was found to be to that of common air as 84.3 to 1000; and, conſequently, near 12 times lighter.

proportions already mentioned, the diminution was the ſame as with inflammable air produced from the malleable kind, viz. 1.56.

136
Fixed air convertible into inflammable air.

In theſe experiments, it ſeemed evident, that at leaſt part of the fixed air found after the exploſion was produced by its means; but the following ſeem no leſs convincing proofs, that fixed air may be converted into the inflammable kind, or at leaſt that the elements of fixed air may remain in inflammable air in ſuch a manner as to be imperceptible. On heating in an earthen retort a quantity of ſlaked lime, which had long been kept cloſe corked in a bottle, it gave air, of which one-fifth was generally fixed air; but in the gun-barrel the ſame lime yielded no fixed air at all, but a great quantity of inflammable air of the exploſive kind, like that which is got from iron alone by means of water. As this total diſappearance of the fixed air appeared extraordinary, the Doctor was induced to repeat it ſeveral times with all poſſible care; and the following was the reſult of his experiments: Three ounces of ſlaked lime, which had for ſome time been expoſed to the open air, heated in an earthen tube, yielded 14 ounce-meaſures of air, of which only two and an half remained unabſorbed by water; the reſiduum was ſlightly inflammable, but not perfectly phlogiſticated. Three ounces of the ſame lime, heated in a gun-barrel, gave 20 ounce-meaſures of air, all of which was inflammable, and no part fixed. It was expected, however, that the fixed air would have appeared on the decompoſition of this inflammable air with the dephlogiſticated kind: but after this proceſs, it appeared to be exactly ſuch inflammable air as is procured from metals by the mineral acids, or by ſteam; the diminution of the two kinds of air being exactly the ſame: and tho' ſome fixed air was found in the reſiduum, it was no more than is uſually met with in the decompoſition of inflammable air procured by means of ſpirit of ſalt.—Suppoſing that the two kinds of air might incorporate, when one of them was generated within the other, a gun-barrel was filled with fixed air, and the cloſed end of it put into a hot fire. Inflammable air was inſtantly produced; but when the fixed air was ſeparated from it, it burned like inflammable air with which no other kind had ever been mixed.

On heating iron-turnings in five ounce-meaſures of fixed air, the quantity of it was increaſed about one ounce-meaſure, and there remained one and three-fourths unabſorbed by water. The experiment was repeated with the ſame reſult; and it was farther obſerved, that though the inflammable air procured in this manner did not appear by the teſt of lime-water to contain any fixed air, yet when it was decompoſed by firing it with an equal quantity of dephlogiſticated air, the reſiduum contained one-third of fixed air. The diminution was to 1.45. Hence the Doctor conjectures, that though, in ſome caſes, the fixed air appears to be *generated* by the decompoſition of dephlogiſticated and inflammable air, yet that inflammable air, when thus produced in contact with fixed air, may *combine* with it, ſo as to be properly *contained* in it, and in ſuch a manner that it cannot be diſcovered by lime-water.

137
Great propenſity of inflammable air to unite with water.

Inflammable air, when produced in the drieſt way poſſible, is exceedingly light, as has been already obſerved: but Dr Prieſtley has found, that by ſtanding on water, a very conſiderable increaſe is made in its ſpecific gravity; ſo that from being ten or twelve times lighter than atmoſpherical air, it ſoon becomes only ſeven times lighter. This great propenſity to unite with water is alſo taken notice of by Mr Kirwan; who tells us, that the bulk of inflammable air obtained over water with the aſſiſtance of heat towards the end, was one-eighth greater than when produced over mercury; but that the weight of it in the former caſe was only eight or nine times leſs than common air.——"From 85 cubic inches of inflammable air obtained over water, I extracted," ſays he, "by oil of vitriol expoſed to it for 55 hours, two grains of water; and, though undoubtedly there is an error in all theſe experiments, yet there can be little doubt but this inflammable air contained one-half its weight of water. The inflammable air, by the ſubtraction of its water, loſt its ſmell, but continued as inflammable as ever; and therefore there is no reaſon to think that it was decompoſed, or that water is any way eſſential to it."

138
Mr Kirwan's concluſion concerning the principles of inflammable air.

The concluſion is directly contrary to that of Dr Prieſtley, that *water* is an eſſential ingredient in the compoſition of inflammable air; nor do the experiments of the latter, already recited, ſeem to have had any weight with him, as he concludes his Treatiſe on Phlogiſton in theſe words. "To the proofs I have heretofore given, that inflammable air and phlogiſton are the ſame ſubſtance, juſt as ice and the vapour of water are called the ſame ſubſtance, no objection of any weight has ſince been made. Some have thought, that I ſhould have included the matter of heat or elementary fire in the definition of inflammable air: but as fire is contained in all corporeal ſubſtances, it is perfectly needleſs, except where bodies differ in the quantity of it they contain; and in this reſpect I expreſsly mentioned its difference with phlogiſton to conſiſt.—Others, attending to the quantity of water contained in inflammable air, have ſuppoſed it to be an eſſential ingredient in the compoſition of this air, and have called it *phlogiſticated water;* but they may as well ſuppoſe water to be an eſſential ingredient in common air, or fixed air, and call this laſt *acidulated water:* for inflammable air, equally as other airs, may be deprived of its water without any limitation, and yet preſerve all its properties unaltered; which ſhows the preſence of water to be no way eſſential to it. Laſtly, others have thought, that it eſſentially requires an acid or an alkali, or ſome ſaline ſubſtance, for its baſis; as if there were any more repugnance in the nature of things, that phlogiſton ſhould exiſt in an aerial ſtate without any baſis, than marine air, alkaline air, or dephlogiſticated air; when it is evident, that an aërial ſtate requires no more than a certain proportion of latent heat: but the production of inflammable air from iron by means of diſtilled water, without any acid or ſalt, has effectually done away any ſuſpicion of that ſort."

139
Dr Prieſtley's concluſion.

On the other hand, Dr Prieſtley informs us, that "inflammable air ſeems now to conſiſt of water and inflammable air: which, however, ſeems extraordinay, as the two ſubſtances are hereby made to involve each other; one of the conſtituent parts of water being inflammable air, and one of the conſtituent parts of inflammable air being water; and therefore, if the experiments would favour it (but I do not ſee that they do ſo), ſo), it would be more natural to ſuppoſe, that water, like fixed air, conſiſts of phlogiſton and dephlogiſticated air, in ſome different mode of combination.

"There is an aſtoniſhing variety in the different kinds of inflammable air, the cauſe of which is very imperfectly known. The lighteſt, and therefore probably the pureſt kind, ſeems to conſiſt of phlogiſton and water only. But it is probable that *oil*, and that of different kinds, may be held in ſolution in ſeveral of them, and be the reaſon of their burning with a lambent flame, and alſo of their being ſo readily reſolved into fixed air when they are decompoſed by dephlogiſticated air; though why this ſhould be the caſe, I cannot imagine.

"When inflammable and dephlogiſticated air are burned together, the weight of the water produced is never, I believe, found quite equal to that of both kinds of air. May not the *light*, therefore, emitted from the flame, be part of the phlogiſton of the inflammable air united to the principle of heat? And as light accompanies the *electric-ſpark*, may not this alſo be the real *accenſion* of ſome phlogiſtic matter, though it is not eaſy to find the ſource of it?"

The French chemiſts, who deny the exiſtence of phlogiſton, are of opinion, that inflammable air is a ſimple uncompounded element; but for a more full diſcuſſion of this ſubject, ſee the article Phlogiston.

140 Abſorption of inflammable air by water.

Inflammable air is abſorbed by water in conſiderable quantity, but by the application of heat may be expelled again in equal quantity. By agitation in water Dr Prieſtley was formerly of opinion that this kind of air might be rendered as good as common air; but this undoubtedly proceeds from the atmoſpherical air tranſmitted by the water, as is the caſe with phlogiſticated air mentioned in the laſt ſection. After a quantity of water, which had abſorbed as much inflammable air as it could, had been ſuffered to ſtand a month, it was expelled by heat, and found to be as ſtrongly inflammable as ever. The water, after the proceſs, depoſited a kind of filmy matter; which he ſuppoſed to be the earth of the metal that had been employed in producing it.

141 Its effects on vegetation and animal life.

Plants in general grow tolerably well in inflammable air, and the willow plant has been obſerved to abſorb great quantities of it. Its inflammability is not diminiſhed by the putrefaction of animal ſubſtances, nor does their putrefaction ſeem to be retarded by it. Animals confined in it are killed almoſt as ſoon as in fixed air: but inſects, which can live a conſiderable time in phlogiſticated air, live alſo a conſiderable time in this kind of air; but at laſt they become torpid, and appear to be dead, though they will ſtill recover if removed into the open air. Mr Cavallo relates, that the Abbé Fontana, having filled a large bladder with inflammable air, began to breathe it in his preſence; after having made a very violent expiration, in which caſe the effects are moſt powerful. The firſt inſpiration produced a great oppreſſion in his lungs, the ſecond made him look very pale, and the third was ſcarce accompliſhed when he fell on his knees through weakneſs. Birds and ſmall quadrupeds, incloſed in ſmall veſſels of this air, died after a very few inſpirations.

142 Has little refractive power.

Laſtly, inflammable air appears to have a ſmaller ſhare of refractive power than common air; for Mr Warltire informs us, that having placed an hollow triangular priſm, of which the angle was 72 degrees, ſo as to half cover a large object-glaſs in one of Mr Dollond's perſpectives, and ſo turned round as to make the frame of a window, at the diſtance of 1280 feet, ſeen partly through the priſm and partly through common air, appear undivided. The inflammable air was then blown out of the priſm, but no part of the apparatus was moved; when the frame of the window ſeen through the object-glaſs and the priſm as before, ſeemed to ſeparate about four inches.

143 Schemes to employ it for various purpoſes.

The inflammability of this ſpecies of air has given occaſion to various projects concerning it; ſuch as that of employing it to give light and heat; and lamps have been deſcribed, which may be lighted by the electric ſpark in the night-time. By its means alſo very pretty artificial fires are made, with glaſs tubes bent in various directions, and pierced with a great number of ſmall apertures. The inflammable gas is introduced into theſe tubes, from a bladder filled with that fluid, and fitted with a copper cock. When the bladder is preſſed, the inflammable air, being made to paſs into the tube, iſſues out of all the ſmall apertures, and is ſet on fire by a lighted taper. None of theſe contrivances, however, have ever been applied to any uſe; and the ſcheme of Mr Volta, who propoſed to ſubſtitute its exploſive force inſtead of gun-powder, is found inſufficient, on account of the weakneſs of the exploſion, except when the two airs are fired in very great quantity, which would be incompatible with the ſmall bulk neceſſary for warlike engines.

Sect. VII. *Sulphurated Inflammable Air.*

This was diſcovered by Dr Prieſtley at the time when he was engaged in the experiments of which ſome account has been given in the laſt ſection, of tranſmitting the ſteam of water and other fluids through red-hot tubes containing ſome ſolid material.

144 Firſt procured from mangane$ſ$e.

Having among others, treated manganeſe in this manner, by ſtopping one end of the heated tube with a cork before the ſteam was applied, he received forty ounce-meaſures of air, of which one-ſixth was fixed air and the reſt of the ſtandard of 1.7, lambently inflammable. Having then opened the other end of the tube in order to admit the ſteam, air was procured more copiouſly than before. Of 50 ounces of this air, one-ſeventh was fixed, and the reſt, of the ſtandard of 1.8, exploſively inflammable. The laſt portions were very turbid; and the ſmell, eſpecially that of the laſt portion, was very ſulphureous, tinging the water of a very dark colour, by depoſiting in it a quantity of blackiſh water. However, the air itſelf became preſently tranſparent, and had no other appearance than that of any other kind of air. On looking at the jar in about ten minutes after, it was quite black and opaque; ſo that nothing could be ſeen in the inſide of it. Filling afterwards another jar with the ſame kind of air, in order to obſerve the progreſs of this uncommon phenomenon, he found, that when the water was well ſubſided, black ſpecks began to appear in different places, and, extending themſelves in all directions, at length joined each other, till the whole jar was become perfectly black, and the glaſs opaque. When this was done, he tranſferred the air into another jar; and it ſoon produced a ſimilar effect upon this, though it never became ſo black as the jar in which it had been firſt received. It alſo frequently happened, that only the lower part of the jar would become black, as if the matter with which it was loaded had kept ſubſiding, though inviſibly, in the maſs of air, and occupied only the lower regions, leaving the upper part entirely free from it. On expoſing to the open air the veſſels thus turned black, the colour preſently diſappeared, and a yellow or brown incruſtation was left upon it. The ſame change took place when the veſſels were inverted in water, in order to obſerve the alteration of the air within them; but on examining this air, no ſenſible change was perceived. In ſome caſes, indeed, he thought the air was injured, but it was much leſs ſo than he had expected. After depoſiting the black matter, the air ſtill retained its ſulphureous ſmell, and he did not imagine that it would ever leave it entirely.

145 Procured from iron melted in vitriolic acid air.

On trying other ſpecimens of mangane, no air of this kind was obtained; but ſome time after, having occaſion to make a large quantity of inflammable air, he uſed, inſtead of freſh iron, ſome that had been already melted in vitriolic acid air. Diſſolving this with a conſiderable quantity of freſh metal in diluted vitriolic acid, he found that the water in which the air was received became very black, and depoſited more ſediment than had appeared in the experiment with the mangane. The jars were as black as ink, but became yellow on expoſure to the air as before; ſo that there could be no doubt of its being the ſame thing he had got before. On burning a quantity of it, this kind of air appeared to contain ſome vitriolic acid, the balloon being filled with a very denſe white fume, which rendered the water ſenſibly acid to the taſte. On decompoſing it with deplogiſticated air, however, he found the diminution exactly the ſame as when common inflammable and dephlogiſticated air were uſed; ſo that it appeared to contain neither more nor leſs phlogiſton than the other: only there was a ſmall quantity of fixed air produced, which is never the caſe with common inflammable air from vitriolic acid and iron.

When the ſulphurated inflammable air is received over mercury, very little black matter is produced on the jars; and it is remarkable, that though the black matter collected on them, when the air is taken through water, ſoon grows yellow upon expoſing it to the air, it is not the caſe with that which remains in the water; it adheres to the evaporating veſſel in form of a black incruſtation, which does not burn blue until it has been digeſted in the nitrous acid, which deprives it of its ſuperfluous phlogiſton, and leaves it both of the colour and ſmell of ſulphur.

SECT. VIII. *Of Alkaline Air.*

THIS was procured by Dr Prieſtley, in the beginning of his experiments, from common ſpirit of ſal-ammoniac with quicklime, or the materials from which it is made. He did not at that time proſecute the diſcovery farther than by impregnating water with it; by which means he could make a much ſtronger alkaline ſpirit than any to be met with in the ſhops. His method of procuring it was by mixing one part of pounded ſal-ammoniac with three parts of ſlacked lime; and for common experiments the ſame quantity of materials would laſt a conſiderable time.

147 Properties of alkaline air.

This kind of air, when pure, is inſtantly fatal to animal life, and extinguiſhes flame; though, when mixed with common atmoſpherical air, it is ſlightly inflammable, and alſo medicinal in faintings and other caſes of debility. A candle dipped into a jar of this air is extinguiſhed; but juſt before the flame goes out, it is enlarged by the addition of another flame of a pale yellow colour, and ſometimes a weak flame ſpreads for a conſiderable way, or even through the whole body of the alkaline air. The electric ſpark taken in it appears of a red colour. Every ſpark taken in it augments its bulk, and by degrees turns the whole into inflammable air. It is readily abſorbed by water, as has been already obſerved, and diſſolves ice almoſt as faſt as an hot fire. On confining ſome water impregnated with alkaline air in a glaſs tube, and thus expoſing it to a ſtrong heat in a ſand-furnace for ſome days, he obſerved that a white ſediment or incruſtation was formed on the ſurface. The Doctor remarked, that bits of linen, charcoal, and ſponge, admitted into a quantity of alkaline air, diminiſhed it, and acquired a very pungent ſmell; eſpecially the ſponge, a bit of which, about the ſize of an hazle-nut, abſorbed an ounce-meaſure. It is remarkable that copper, which is ſo eaſily corroded by the common volatile alkalis, is not affected by alkaline air. The ſpecific gravity of this kind of air is, by Mr Kirwan, determined to be to that of common air as 600 to 1000; though, as he juſtly obſerves, this muſt differ very conſiderably according to the quantity of moiſture it contains.

147 Proofs of its containing phlogiſton.

In proſecuting his experiments on alkaline air, Dr Prieſtley concluded that it contains phlogiſton, both from its being convertable into inflammable air by electric exploſions, and likewiſe from its reviving the calces of metals. In attempting to aſcertain the quantity of lead revived in alkaline air, he met with two difficulties; the firſt, on account of ſome part of the calx being blackened and imperfectly revived; the ſecond, that the lead completely revived was diſſolved by the mercury employed to confine the air. To prevent this laſt inconvenience, he put the powdered maſſicot (the ſubſtance he choſe to employ on this occaſion) into ſmall earthen cups, contriving to place them with their mouths upwards, in ſuch a manner, that when the lead was revived by means of a burning lens, it would remain in the cup, and not mix with the mercury which ſupported it. The proportions of metal then revived, were ſix grains of lead in three ounce-meaſures, 16½ in three meaſures and an half, 13 in two and an half, and 12 in three and three-fourths; but the experiment on which he laid the greateſt ſtreſs, was that in which 26½ grains of lead were revived in 7½ ounce-meaſures of alkaline air. In this proportion, 100 ounce-meaſures of alkaline air would revive 352 grains of lead; but an equal quantity of inflammable air from iron would have revived 480 grains of metal. This deficiency appeared ſomewhat ſurpriſing to the Doctor, conſidering that alkaline air is reſolved into more than twice its bulk of the inflammable kind; though it is poſſible, that inflammable air from iron may contain more phlogiſton than that into which alkaline air is reſolvable.

On heating red precipitate in alkaline air, the mercury was revived as in other caſes, and a conſiderable quantity of water was produced, though none appears on reviving it with common inflammable air. "It has even (ſays he) run down in drops in the inſide of a veſſel which contained five ounce-meaſures of the air; and a conſiderable quantity of dephlogiſticated air was found in the reſiduum." On throwing the focus of the lens on red precipitate, incloſed in this kind of air, till three meaſures of it were reduced to two, water was produced as uſual, and the ſtandard of the reſiduum was 1.7. In another experiment, a violent exploſion took place before he could obſerve whether any water was produced or not.

148 Converſion of alkaline into inflammable air.

In examining the phenomena which attend the converſion of alkaline air into the inflammable kind, the Doctor was induced to believe that it was occaſioned by heat alone, without the concurrence of light. The effects of the former were ſoon perceived on heating ſome ochre of iron in alkaline air; when, though the matter turned black, as in an incipient reduction of the metal, he found a conſiderable increaſe of quantity inſtead of decreaſe in the air, as he had expected; and, on examining the quality of it, he found that it contained no fixed air, but was entirely inflammable. With ſcales of iron a ſimilar enlargement was perceived; but in this way he could never increaſe the quantity to more than double that which had been originally employed, and even after this the whole ſmelled ſtrongly of volatile alkali; the iron had undergone no change.

The Doctor now, concluding from theſe experiments that the change of alkaline into inflammable air was produced by this cauſe alone, proceeded to repeat the experiment, by heating in the alkaline air bits of dry crucibles, or of earthen retorts, which had been juſt before expoſed to very great heats, ſo that they could not be ſuppoſed to give out any air themſelves, and therefore could only ſerve to communicate a ſtrong heat to the alkaline air; and in theſe experiments the reſult was the ſame as when ochre and iron were made uſe of. The bits of white earthen ware were always turned black; but finding the ſame effect of augmenting the air and giving it an inflammable quality, though he uſed the bit of crucible over and over again, he was thoroughly convinced that the change was effected by heat alone.

In all theſe experiments, however, with a burning-glaſs, as a ſtrong light was alſo concerned, he heated a quantity of alkaline air in a green glaſs retort, receiving in a glaſs tube, filled with water, all the air that could be expelled from it by heat. At firſt it was all abſorbed by the water, being merely alkaline air expelled by the rarefaction; but when the bulb of the retort became red-hot, he found that the bubbles driven out were not wholly abſorbed, and at laſt none of them were ſo. Theſe were altogether inflammable; ſo that no doubt remained of the change being produced by heat alone without any intervention of light.

It was farther obſerved, that whenever the alkaline air was changed into inflammable by means of bits of retorts or crucibles containing clay, they always became black during the proceſs. He inclined therefore to ſuppoſe, that ſomething might be depoſited from the air which might attach itſelf to the clay. "Indeed, (ſays he) if this was not the caſe, I do not ſee why the clay ſhould become black; though, perhaps, part of the ſame phlogiſton which forms the inflammable air may be attracted by the red-hot clay, without there being any proper decompoſition of the air. That this is the caſe ſeems probable from an experiment in which I uſed porcelain inſtead of common earthen ware; which did not become black in the proceſs, though inflammable air was produced."

149 Volatile alkali produced from nitrous air and iron.

In ſome of Dr Prieſtley's experiments he had obſerved that iron, which had long ruſted in nitrous air, gave out a ſtrong ſmell of volatile alkali. This extraordinary phenomenon, however, was only perceived where the nitrous air and iron had been in contact for a very long time; but he found that it was much ſooner produced by making uſe of a weak ſolution of copper; by putting iron into which, he obtained that ſpecies of nitrous air called *dephlogiſticated*. A phial containing ſome of this iron, which had been uſed only once for the purpoſe juſt mentioned, having been kept cloſe corked for about two months, was accidentally broken; when ſome pieces of the iron were found covered with a green cruſt, and theſe had a ſtrong ſmell of volatile alkali. On making ſome more experiments on this ſubject, he found that two months ſtanding was requiſite to produce the alkaline ſmell deſired.

Sect. VIII. *Of Nitrous Air.*

150 How produced.

This kind of air is plentifully obtained in all caſes where the nitrous acid is combined with phlogiſton: Thus, when it is mixed with metals, or animal or vegetable ſubſtances, nitrous air is produced in great quantities; but very ſparingly when treated with metallic calces, earths, or other matters which are ſaid to contain little or no phlogiſton. All the metals, excepting gold, platina, and regulus of antimony, which are not ſoluble in the pure nitrous acid, yield nitrous air on being treated with it; and even from theſe, when diſſolved in aqua regia, ſome quantity of this air may be obtained. Every metal, however, does not yield it in equal quantity, with equal facility, or equally good. Silver, copper, iron, braſs, biſmuth or nickel, when put into nitrous acid, yield this air in conſiderable quantity: Mercury yields it but ſlowly without the application of heat, though no great degree of it is neceſſary. Copper and iron, eſpecially the latter, require the acid to be cautiouſly applied on account of the violent emiſſion of fumes. Gold, platina, and regulus of antimony, when put in aqua regia, yield nitrous air pretty readily; but lead yields it in ſmaller proportion than any other metal, and zinc does the ſame among the ſemimetals, the elaſtic fluid produced from it being moſtly phlogiſticated air.

151 Why ſtrong nitrous acid yields its nitrous air.

In the production of this kind of air, great differences are perceived by a diverſity in the ſtrength of the acid. Thus, if we diſſolve copper in ſtrong nitrous acid, no nitrous air is produced, though the ſame materials will yield air in great quantity by the mere affuſion of water to dilute the acid. This is very properly explained by Doctor Prieſtley, from the property that the nitrous acid has of attracting phlogiſton, which is evident from what happens in the ſolution of mercury. When ſtrong ſpirit of nitre is poured upon this metal, the ſolution ſoon begins, and is very rapid, yet not a ſingle bubble of elaſtic fluid is produced; but in a ſhort time the acid next to the mercury is changed into an orange colour, which is an indication of its having acquired phlogiſton, probably from the nitrous air which is decompoſed the moment it is formed, and before its particles are united into viſible bubbles. The bubbles of air indeed break through the coloured acid but they diſappear the moment they come in contact with the pale-coloured acid. As ſoon as the whole quantity of acid has aſſumed the orange-colour, nitrous air eſcapes from it in conſiderable quantity; but the mixture of water deprives the acid of its power of decompoſing nitrous air. The ſtrong and pale-coloured nitrous air ought to be diluted with at leaſt two or three parts of water to one of the acid, for the eaſy production of nitrous air from copper and mercury.

In common experiments no other degree of heat is neceſſary than that produced by the efferveſcence itſelf, except mercury be uſed, which requires the application of ſome degree of heat; but when the metal expoſes a very great ſurface to the acid, as is the caſe when the filings of the metal are uſed, the efferveſcence and production of nitrous air are often much quicker than can be conveniently managed. The moſt proper method of producing nitrous air, however, is explained in the laſt ſection of this treatiſe.

152
Properties of nitrous air.

Nitrous air by itſelf is equally tranſparent and inviſible with common air, excepting at its firſt production, when it is ſomewhat coloured, owing to a little ſuperfluous nitrous acid, or to ſome earthy particles which are carried up with it. Its ſmell reſembles that of nitrous acid, or indeed is the very ſame; becauſe, in paſſing through the common air to our noſtrils, it is decompoſed, and converted into nitrous acid. The ſame is to be ſaid of its taſte; though Mr Fontana, who taſted it without any contact of external air, affirms that it has no taſte whatever. The method in which he aſcertained this fact was as follows. Having firſt introduced the nitrous air into a bottle of elaſtic gum in water, as is done with glaſs bottles, he brought his mouth, ſhut, while the neck of the elaſtic-gum bottle was under water, near the neck of it; and then, by preſſing the bottle, introduced the nitrous air into his mouth. The experiment, however, is by no means void of danger; for if the perſon happens to draw any quantity of this air into the lungs, he may be nearly ſuffocated, as nitrous air is exceedingly noxious. In performing of it, he recommends to exhauſt the mouth entirely of common air, though he does not inform us how this can be done; nor indeed is it eaſy to conceive the poſſibility of doing ſo.

Though nitrous air extinguiſhes flame, it may by certain proceſſes be brought into ſuch a ſtate, that a candle will burn in it with an enlarged flame; and it becomes what Dr Prieſtley calls *dephlogiſticated nitrous air*, which is treated of in the next ſection. It is remarkable, however, that when a candle is extinguiſhed, as it never fails to be in common nitrous air, the flame ſeems to be a little enlarged about its edges by the addition of another bluiſh flame before the former goes out.

153
Extremely fatal to animal and vegetable life.

Nitrous air ſeems to be the moſt fatal to animal life of any. Even inſects, which can bear phlogiſticated and inflammable air, generally die the moment they are put into it. Frogs, ſnails, and other animals which do not reſpire very frequently, die in a few minutes, and general do not recover even when taken out of this noxious fluid before they are dead. Plants periſh very ſoon in nitrous air, and even in common air ſaturated with nitrous air; but Dr Prieſtley informs us, that "though in general plants die almoſt immediately in water impregnated with nitrous air, yet in one caſe of this kind, when the ſuperfluous nitrous air was let out under water, ſo that no part of it was decompoſed in contact with the water, the plant grew in it remarkably well."

Water, by agitation in nitrous air, may be made to imbibe one tenth part of its bulk; and afterwards the nitrous air may be expelled again by boiling, though not in the ſame quantity as it was abſorbed; but for this purpoſe the water ſhould be previouſly deprived of its air. Dr Prieſtley informs us, that having carefully pumped all the air out of a quantity of rain-water, letting it ſtand 24 hours in a good vacuum, and then impregnating it with nitrous air, he inſtantly expelled it again by boiling, when he obtained only about one fourth part of it, though ſufficiently pure, and without any mixture of fixed air. Water may alſo be deprived of the nitrous air it contains, though it does not freeze quite ſo readily when impregnated with this air as in its natural ſtate.

Nitrous air is abſorbed by ſtrong oil of vitriol nearly in the ſame quantity as by water; the acid acquiring a purple colour, by reaſon of the phlogiſton contained in the nitrous air. The ſtrong nitrous acid abſorbs it in great quantity; and becomes ſmoking, orange-coloured, and afterwards green, on account of the phlogiſton contained in it. Marine acid imbibes but a ſmall quantity, and very ſlowly, acquiring at the ſame time a light-blue colour. Both nitrous air and common air phlogiſticated by it are meliorated by agitation in nitrous acid.

Nitrous air is abſorbed in conſiderable quantity by radical vinegar, and the concentrated vegetable acid.—Solution of green vitriol imbibes it in much greater quantity than water, and acquires a black colour; which, however, ſoon goes off by expoſure to the common air. Its taſte alſo becomes acid.—Very little is abſorbed by cauſtic alkalis. Oil-olive ſlowly abſorbs a conſiderable quantity, but oil of turpentine abſorbs much more. By a little agitation, it will imbibe more than ten times its quantity of nitrous air; acquiring at the ſame time a yellowiſh or orange colour, and becoming a little glutinous. The part which is not abſorbed appears to be converted into phlogiſticated air.—Ether and ſpirit of wine abſorb it very quickly, but no nitrous air is obtained by the application of heat after they have abſorbed it. It is greatly diminiſhed by oil of turpentine, liver of ſulphur, and pyrophorus; all of which leave it in a phlogiſticated ſtate. It is alſo diminiſhed and phlogiſticated by being kept in a bladder, alternately expoſed to moiſture and dryneſs. Nitrous acid air has the ſame effect.

154
Diminiſhes dephlogiſticated air.

One of the moſt remarkable properties of nitrous air, is its diminution with dephlogiſticated air; by which means it becomes a teſt of the quantity of that kind of air contained in the atmoſphere. With pure dephlogiſticated air, the diminution is almoſt to nothing, at the ſame time that ſome quantity of nitrous acid is reproduced by the decompoſition of the nitrous air; but as our atmoſphere is always mixed with a conſiderable quantity of phlogiſticated air, on which nitrous air has no effect, the diminution in this caſe is never ſo conſiderable. Upon this principle the EUDIOMETER is conſtructed.

155
Its antiſeptic power.

Another very remarkable property of nitrous air is its ſtrong antiſeptic power; inſomuch that animal matters may, by its means, be preſerved for many months without corruption. This property, it was thought, might have been extremely uſeful on many occaſions; but Dr Prieſtley, after a number of experiments on the ſubject, concludes in the following manner. "Nitrous air will indeed preſerve meat from putrefaction; but after long keeping, it becomes very offenſive both to the noſtrils and palate, though the ſmell is not altogether that of putrefaction; and indeed the ſubſtance continuing quite firm, it could not be properly putrid.—Having formerly experienced the remarkable antiſeptic power of nitrous air, I propoſed an attempt to preſerve anatomical preparations, &c. by means of it; but Mr Key, who made the trial, found, that, after ſome months, various animal ſubſtances were ſhrivelled, and did not preſerve their forms in this kind of air."

156
Specific gravity of nitrous air.

The ſpecific gravity of nitrous air, as well as of other kinds, has been aſcertained by Mr Kirwan. As it corrodes metals, he endeavoured to find its weight by comparing the loſs ſuſtained by the materials which produce it. Thus he found, that 14 grains of the materials produced 38.74 inches of nitrous air; and, conſequently, by proper calculation, that the ſpecific gravity of nitrous air is to that of atmoſpheric air as 1195 to 1000.—"If this air (ſays he) had been obtained over water, or in ſtrong heat, its weight would probably have been very different; as it is liable to be mixed with phlogiſticated air, nitrous vapour, and a variable quantity of water. Nitrous vapour would render it heavier, and phlogiſticated air or water probably lighter."

157
Component parts of nitrous air.

With regard to the conſtituent principles, or elements of nitrous air, all thoſe who look upon phlogiſton to be a diſtinct ſubſtance, have believed that the former is a compound of nitrous acid and phlogiſton. By the oppoſite party, it is ſuppoſed to be a ſubſtance entirely ſimple, and one of the conſtituent parts of the nitrous acid. This opinion ſeems in part now to be entertained by Dr Prieſtley himſelf, notwithſtanding his former ſentiments on the ſubject. "I had no doubt on the ſubject (ſays he) until I read the work of Mr Metherie; who aſſerts, that nitrous air contains no proper nitrous acid, but only one of the elements of it; the other being dephlogiſticated air, which had before been conſidered by Mr Lavoiſier as the principle of all acidity.—Among other obſervations in ſupport of his aſſertion, Mr Metherie has the following. 1. Nitrous air burnt together with inflammable air, produces no nitrous acid. 2. Though nitrous air be obtained from a ſolution of mercury in the nitrous acid, almoſt all the acid is found in the ſolution. 3. Nitrous air abſorbed by marine acid, does not make aqua regia. 4. He is of opinion, that a ſmall portion of the nitrous acid being decompoſed, furniſhes a pure air, ſo altered, that, uniting with inflammable air, it changes it into nitrous air.

"In reviewing the experiments I had formerly made on this kind of air, I could not recollect any of them in which the pure nitrous acid was produced, excepting that with dephlogiſticated air, beſides the experiment in which it was decompoſed by the electric ſpark; which furniſhes a ſtrong objection to this hypotheſis." To aſcertain the matter more fully, the following experiments were made.

"When nitrous air is decompoſed by iron, or by a mixture of iron and ſulphur, the water, over which the proceſs is conducted, acquires no acidity; but I had ſuppoſed that all the acid was abſorbed by the iron. Having by me a quantity of this iron which had been reduced to perfect ruſt in nitrous air, and which, I knew, muſt have imbibed more than its weight of the air, I thought that the acid might be obtained from it by diſtillation; but a quantity of this ruſt of iron, diſtilled in earthen retort, yielded neither nitrous air nor nitrous acid, at leaſt in any quantity that could favour the common hypotheſis.

"I then endeavoured to decompoſe nitrous air by heating iron in it with a burning lens; and in this proceſs I ſucceeded far beyond my expectation: for the air was preſently diminiſhed in quantity, while the iron became of a darker colour, was ſometimes melted into balls, and gathered conſiderable weight, though it had no appearance of containing any nitrous acid.—In the firſt experiment, the original quantity of nitrous air was diminiſhed to about one-third; and after this, it was increaſed." The increaſe was found to ariſe from a production of inflammable and dephlogiſticated nitrous air.

The Doctor proceeded to try various other experiments on the decompoſition of nitrous air, particularly that of burning Homberg's pyrophorus; but without any ſucceſs, or obtaining the ſmalleſt particle of nitrous acid. His concluſions from the whole are the following.

158
Nitrous air compoſed of phlogiſticated nitrous acid and water.

"Water ſeems to be a neceſſary ingredient in nitrous as well as inflammable air; at leaſt, without a quantity of water, nitrous air cannot be formed. For example, copper will be diſſolved in ſtrong nitrous acid without producing any nitrous air, juſt as iron may be diſſolved in concentrated vitriolic acid without producing inflammable air.

"That nothing is neceſſary to the formation of nitrous air beſides phlogiſticated nitrous acid and water, is evident from the production of it by the impregnation of pure water with phlogiſticated nitrous vapour formed by the rapid ſolution of biſmuth; an experiment which I mentioned before. However, to make it in a more unexceptionable manner, I interpoſed a glaſs veſſel between that in which the ſolution was made and that in which the water to be impregnated with the phlogiſticated vapour was contained, that whatever was diſtilled over by the heat of the proceſs might be prevented from reaching the water. In theſe circumſtances, however, when nothing but the dry phlogiſticated vapour could enter the water, it began to ſparkle and yield nitrous air very copiouſly as ſoon as it had received a bluer tinge from the impregnation.—Nitrous air is alſo produced by pouring a highly coloured or phlogiſticated nitrous acid into pure water, in which no metal or earthy matter is any way concerned.

159
Effects of the electric ſpark on nitrous air.

"I have formerly obſerved, how readily nitrous air is diminiſhed by taking the electric ſpark in it. This experiment I have frequently repeated, in order more

Nitrous Air

particularly to aſcertain the quantity and quality of the reſiduum. In one experiment half an ounce of nitrous air was reduced, in leſs than half in hour, to one quarter of its bulk. One-fourth of the reſiduum was ſtill nitrous, and the reſt phlogiſticated. Taking the electric ſpark in a quantity of nitrous air till it was diminiſhed to one-third, the whole was completely phlogiſticated, not affecting common air at all, and extinguiſhing a candle. A white matter was formed with the mercury over which the ſpark was taken, which made the water admitted to it extremely turbid. In another proceſs, the electric ſpark was taken in a quantity of nitrous air till it could be no more diminiſhed, when it was reduced in bulk in the proportion of 10¼ to 24. Letting it ſtand all night upon the mercury, it was increaſed in the proportion of 11¼ to 24; ſeemingly by the acid uniting to the mercury and generating more nitrous air, ſince it had that ſmell. No water appeared after the proceſs; and the water admitted to it acquired no acid taſte, but an aſtringent one like that of water impregnated with nitrous air. There was a white powder formed, as in the former experiments.—To try if it were poſſible to make water imbibe the acid from the nitrous air, the electric ſpark was taken in it, with a ſmall quantity of water over the mercury. But even this water did not acquire any acid taſte, but only an aſtringent one."

The Doctor concludes his experiments on this ſubject with a conjecture, that the phlogiſton, and neither the heat nor light of the electric, contributes to the decompoſition of the nitrous air. As his final ſentiments on the matter, however, are merely conjecture, without any certain experiments to confirm them, we ſhall here refer the reader to his Section on Theory, at the end of his ſixth volume of Experiments, &c.

Sect. IX. *Of Dephlogiſticated Nitrous Air.*

160 How procured.

This ſpecies differs from common nitrous air in being able to ſupport flame, though it ſtill continues fatal to animal life. Common nitrous air may be converted into the dephlogiſticated kind by particular proceſſes; though, when zinc is diſſolved in the nitrous acid, if the air be taken at different times, that which comes about the middle, or rather the latter end of the proceſs, will be of this kind; in which it not only ſupports the burning of a candle, but the flame is enlarged (ſometimes to four or five times its original bulk) by the addition of a weaker and bluiſh flame round the former; and this burning is ſometimes accompanied with a crackling noiſe, as if the candle was burning in dephlogiſticated air. It may alſo be obtained in ſome part of the proceſs of procuring nitrous air from iron, though with this metal the ſucceſs is uncertain; but tin yields a conſiderable quantity of it. By expoſing iron to nitrous air, it may be ſo far dephlogiſticated as to admit a candle to burn in it. Dr Prieſtley filled an eight-ounce phial with nails, and then with mercury; and diſplacing the mercury with nitrous air, left the phial inverted in a quantity of the ſame fluid. Two months after, the nitrous air was found to be changed in ſuch a manner as to admit a candle to burn in it with its natural flame; and by continuing ſtill longer in contact with the iron, a candle would burn in it with an enlarged flame. Theſe changes, however, are very irregular, ſo that they ſeldom produce the like effects with the regularity one might expect. Dr Prieſtley once found, that by the contact of iron in quickſilver, it was ſo changed as to be fired with an exploſion like a weak inflammable air; whilſt another quantity of nitrous air, which had been treated in like manner for about the ſame length of time, only admitted a candle to burn in it with an enlarged flame.

Dephlogiſticated Nitrous Air.

161 Component parts of dephlogiſticated nitrous air.

In that ſection of his laſt volume in which the Doctor treats of this kind of air, he obſerves, that water is abſolutely neceſſary to its compoſition, or rather to the decompoſition of the common nitrous air by iron. He had decompoſed it before, either by previouſly filling the veſſels that were to contain the nitrous air with water or with mercury; though it had always required a much longer time when the latter was made uſe of. The reaſon of its being formed at all in this laſt way, was a ſmall quantity of moiſture adhering to the inſide of the veſſel containing the mercury.

162 Effects of water on nitrous air.

To try the influence of water in this caſe, he now procured a number of very clean ſmall needles; and having made a phial, and likewiſe a proper quantity of mercury, quite clean and dry, he put the needles into the phial, and, filling it up with mercury, introduced the nitrous air: but it continued in this way for ſix or eight months without the ſmalleſt alteration. Introducing a few drops of water, a diminution of about one-third of the air took place, and the remainder appeared to be phlogiſticated. On the 26th of May 1782, he examined a quantity of nitrous air, which had been confined with iron-ſhavings from the 27th of Auguſt preceding, when he found one-half of it abſorbed; the remainder ſupported the flame of the candle better than common air, though a mouſe died in it; and yet this air had continued ſeveral months in the ſame ſtate with regard to quantity, nor was it at all probable that its quality would have been altered by any length of time.

163 Beſt method of procuring it.

Though this kind of air is produced by the contact of iron and nitrous air, the Doctor has never been able to aſcertain the quantity of nitrous air which a given quantity of iron can decompoſe; and though iron ſoon becomes ſo much affected by this proceſs that it crumbles into powder, it ſtill ſeems equally capable of decompoſing a freſh quantity. Having made a comparative experiment, by putting together one quantity of nitrous air with freſh iron and another with ruſt, he found that in both the air was diminiſhed to about one-third, and a candle burned in both equally well; but neither of them had the properties of freſh nitrous air in any degree.

As the proceſs for obtaining dephlogiſticated nitrous air by means of iron is very tedious, the Doctor endeavoured to find another which might be attended with leſs inconvenience. This he accompliſhed by diſſolving turnings of iron in a dilute ſolution of copper in nitrous acid (the ſame that remains after the production of nitrous air), mixing it again with an equal quantity of water. Without this precaution, he tells us, that though the iron will at firſt be acted upon very ſlowly, yet the mixture will at length grow ſo hot as actually to boil, and the proceſs will be exceedingly troubleſome; however it will be neceſſary, previous to any attempt to diſſolve the iron, to heat the ſolution of copper, in order to expel all the nitrous air and ſuperfluous

Dephlogiſticated Nitrous Air.

fluous nitrous acid. Without this precaution a quantity of common nitrous air will be produced.

Dephlogiſticated nitrous air is abſorbed by water almoſt as readily as fixed air, and in conſiderable quantity; the liquid taking up about one-half its bulk of air. After being thus ſaturated, the whole quantity of dephlogiſticated nitrous air may be expelled pure by heat, and is eaſily received in veſſels containing mercury. It was likewiſe obſerved, that as this kind of air much reſembles fixed air in its properties of being imbibed by water, and expelled again by heat, it reſembles it alſo in this farther property, that all the air which has been actually incorporated with the water will not be imbibed by water again. But the proportion of this part is three or four times greater than the correſponding part of fixed air; it is alſo conſiderably more phlogiſticated. Water impregnated with it very ſoon parts with it again on being expoſed to the atmoſphere.—It diſcovers not the ſmalleſt trace of containing either acid or alkali. Its ſpecific gravity is leſs than that of common air. On heating red precipitate in this kind of air, pure dephlogiſticated air was produced without affecting, or being affected by, the nitrous air. Repeating the experiment with malleable iron, the quantity of it was enlarged, and the whole phlogiſticated, without any mixture of fixed air.

164 Made to approach to the nature of atmoſpherical air.

By heating bits of clean crucibles or retorts in this kind of air, it ſeemed to approach in quality to common atmoſpherical air; and the effects were always found to be the more conſiderable the longer the proceſs was continued. On attempting, however, to determine whether this change in the conſtitution of dephlogiſticated nitrous air was occaſioned by means of heat or light, he heated in it earthen tubes; but found, that though theſe were glazed both on the outſide and inſide, and ſeemed perfectly air-tight both before and after the experiment, the air had eſcaped. By the electric ſpark it was rendered wholly immiſcible with water, and brought to the ſtandard of 1.45; ſo that the Doctor had no doubt of its being reſpirable. Yet this kind of air, though it admits a candle to burn ſo well in it, will not kindle pyrophorus, though the nitrous air from which it is produced would inſtantly ſet it on fire.

Sect. X. *Of Vitriolic, Nitrous, Marine, and other Acid Airs.*

165 How procured.

§ 1. *Vitriolic acid Air.*—This is always a combination of vitriolic acid with phlogiſton, and conſequently may be procured from any mixture of that acid in its highly concentrated ſtate with phlogiſtic matters. Hence it is obtained from all the metals, gold and platina excepted, on boiling them with ſtrong oil of vitriol. It is alſo procurable from the ſame acid rendered black by any phlogiſtic matter. No greater heat is required to expel this kind of air than that produced by the flame of a candle. It is the heavieſt of all aërial fluids, next to fluor acid air, being to common air as 2265 to 1000. Dr Prieſtley informs us, that a quantity of vitriolic acid thus impregnated with phlogiſton, will yield many times more air than an equal quantity of the ſtrongeſt ſpirit of ſalt.—When the vitriolic acid air is produced in great plenty, the top of the phial in which it is generated is commonly filled with white vapours. The air has alſo the ſame appearance as it is tranſmitted through the glaſs tube; and it is ſometimes diſcoverable in the recipient. When ſuch ſubſtances are put to the oil of vitriol as cauſe a great efferveſcence with that acid, care ſhould be taken to add them by very ſmall quantities at a time, and likewiſe to apply the heat by very ſlow degrees, leſt the rapid production of air, and the heat attending it, ſhould break the veſſels. It is moſt equably produced by uſing ſtrong oil of vitriol and charcoal; but in moſt caſes the production of vitriolic acid air is attended with that of inflammable, and ſometimes fixed or phlogiſticated air. With ether, about one-half of the firſt produce is inflammable; but the quantity leſſens as the proceſs goes on. The Doctor obſerved, that, when quickſilver was uſed, the acid was not turned black, as in other experiments of the like nature. He alſo obſerved, that iron yielded a little inflammable air together with the acid gas; but that the elaſtic fluid produced when zinc was uſed, contained about two parts of inflammable and one of acid air. Copper, ſilver, and lead, when heated in vitriolic acid, yield the pureſt vitriolic acid air, without any mixture of inflammable air; but the lead yields only a very ſmall quantity, and requires a great degree of heat. It is procured in the greateſt abundance from the fumes of burning ſulphur, and is then called the *volatile vitriolic*, or *ſulphureous acid*; for an account of the properties of which, ſee Chemistry (*Index*).

Nitrous Acid Air.

166 How obtained.

§ 2. *Of Nitrous Acid Air.*—This is the pure nitrous acid by itſelf, without any addition of phlogiſton. It is procured by heating the ſtrong ſpirit of nitre in a phial, and then receiving the vapour in glaſs veſſels filled with quickſilver. It is, however, extremely difficult, or rather impoſſible, to preſerve it for a length of time by means of any fluid hitherto known.

167 Cannot be preserved by means of fluids.

Water abſorbs it immediately, and quickſilver is corroded, and produces nitrous air. "But (ſays Dr Prieſtley) tho' the acid vapour very ſoon unites with the quickſilver, yet the jar in which it was received being narrow, the ſaline cruſt which was formed on the ſurface of the quickſilver, impeded the action of the acid upon it till I had an opportunity of admitting water to the air I had produced, and of ſatisfying myſelf, by its abſorption, of its being a real acid air, having an affinity with water ſimilar to other acid airs."

168 Aſſumes a red colour by being heated.

The moſt remarkable property of this vapour is, that its colour may be made more or leſs intenſe by the mere circumſtance of heat. It may be confined in glaſs veſſels with ground-ſtoppers, or in tubes hermetically ſealed, and thus expoſed to the action of heat: in which caſe it will be found, that the colour of the vapour becomes conſiderably more intenſe in proportion as the glaſs veſſel containing it is more or leſs heated; and that, on the contrary, the intenſity of the colour diminiſhes as it is cooled. "It ſeems probable (ſays Dr Prieſtley), that if this vapour was not confined, but had room to expand itſelf, it would become colourleſs with heat. This at leaſt is the caſe when it is combined with water. The phenomena I refer to are very common in the proceſs for making dephlogiſticated air, in which I firſt obſerved them. But the ſame things are obſervable in the proceſs for producing any other kind of air in which much ſpirit of nitre is made uſe of; and likewiſe conſtantly in the common proceſs for making ſpirit of nitre itſelf. It is, that when the heat is moderate, the vapour within the glaſs tube or retort is red; but that, as the heat increaſes, it becomes tranſparent." The Doctor having obſerved that red lead, impregnated with nitrous vapour, may be preſerved a long time without deliqueſcing or loſing its acid, made uſe of a compoſition of this kind for procuring a nitrous vapour with which he filled his tubes. By imbibing this vapour the minium loſt its red colour and became white. "I put (ſays he) a ſmall quantity of this white minium into a glaſs tube cloſed at one end; then holding it to the fire, make it emit the red vapour till the whole tube is filled with it; and having the other end of the tube drawn out ready for cloſing, as ſoon as the vapour begins to iſſue out of that end, I apply my blow-pipe and ſeal it. By this means I conclude that the tube is filled with a pure red vapour, without any mixture of nitrous air, and perhaps common air alſo." For a further account of the properties of nitrous acid air, ſee CHEMISTRY, (*Index.*)

169 Its effects on red-lead

§ 3. *Of Marine Acid Air.*—The marine acid, by heat, may be reſolved into a permanently elaſtic and tranſparent inviſible vapour, which, however, is more eaſily preſerved in its aërial ſtate than nitrous acid air, as the former has no effect upon quickſilver. An eaſy and cheap method of obtaining this kind of air is by filling a phial, fitted with a glaſs tube and ſtopper, with common ſalt, and then pouring a ſmall quantity of oil of vitriol upon it; which, by the aſſiſtance of heat, will diſengage the acid principle, or the marine acid air, from the ſalt. "A phial (ſays Dr Prieſtley) prepared in this manner will ſuffice, for common experiments, many weeks; eſpecially if ſome more oil of vitriol be occaſionally put to it. It only requires a little more heat at the laſt than at the firſt. Indeed, at firſt, the heat of a perſon's hand will often be ſufficient to make it throw out the vapour. In warm weather it will even keep ſmoking many days without the application of any other heat. On this account it ſhould be placed where there are no metallic utenſils which it can corrode; and it may eaſily be perceived when the phial is throwing out this acid vapour, as it always appears in the open air in form of a light white cloud."

170 How obtained.

After the marine acid has yielded all the air that can be expelled from it, it is extremely weak, ſo that it can but barely corrode iron. The gas itſelf is conſiderably heavier than common air, the ſpecific gravity of the two being in the proportion of five to three; a cubic inch weighing 0.654 grains. It is very fatal to animal life, but leſs ſo than pure nitrous air; for flies and ſpiders live longer in marine acid than in nitrous air. In dipping a candle into a jar of this air the flame is extinguiſhed; but the moment before it goes out, and alſo when it is afterwards firſt lighted again, it burns with a green or light-blue flame, like that of common ſalt thrown into a fire. Its diminution by the electric ſpark is barely perceptible. Ice is diſſolved by it as faſt as if it touched a red-hot iron. It is partly abſorbed by almoſt every ſubſtance containing phlogiſton, and the remaining part becomes inflammable. Oil of olives abſorbs it very ſlowly, and oil of turpentine very faſt; by which they both become almoſt black, and the remainder of the air is inflammable. Eſſential oil of mint abſorbs marine air pretty faſt, becoming brown, conſiſtent, and ſo heavy as to ſink in water; and its ſmell is in a great meaſure altered. Ether abſorbs it very faſt, and has its colour altered by the impregnation, becoming firſt turbid, then yellow, and at laſt brown. The air over the ether is ſtrongly inflammable. A ſmall bit of phoſphorus ſmoked and gave light in this acid air; and the elaſtic fluid was but little diminiſhed in twelve hours. On the admiſſion of water, about four-fifths of the gas were abſorbed, and the reſt was inflammable. This change was alſo effected by a great number of other ſubſtances: ſome of which, however, require a conſiderable time to produce their effect; ſuch as cruſts of bread not burned, dry wood, dry fleſh, roaſted pieces of beef, ivory, and even flints. See CHEMISTRY, (*Index.*)

171 Its properties.

172 Changed into inflammable air.

§ 4. *Of Fluor Acid Air.*—The diſcovery of fluor acid air was made by Mr Scheele, who obtained it by diſtilling the ſpar called fluor with vitriolic acid. Dr Prieſtley, who made ſeveral experiments upon the ſubject, was of opinion that this new acid was only the vitriolic diſguiſed by its connection with the fluor. He even ſuppoſed that he had produced it by pouring vitriolic acid on other phoſphoric ſpars: both theſe opinions, however, he has now retracted, and believes the fluor acid to be one of a peculiar kind. Its moſt remarkable property is the great attraction it has for ſiliceous earth, ſo that it even corrodes and makes holes in the retorts in which it is diſtilled. See CHEMISTRY, (*Index.*)

173 Different from vitriolic acid air.

§ 5. *Of the Vegetable and other Acid Air.*—By means of heat alone, the concentrated vegetable acid emits a permanently elaſtic and aërial fluid. This has the properties of the acid of vinegar; but, like it, is weaker than the reſt of the mineral acid airs, though it agrees with them in its general characters. Water imbibes it as readily as any of the other acid airs; oil-olive readily abſorbs it, and in conſiderable quantity, loſing at the ſame time its yellowiſh colour, and becoming quite tranſparent. Common air is phlogiſticated by it, as it is alſo by the liquid vegetable acid. As the vegetable acid, however, from which this air had been obtained, was diſtilled by oil of vitriol, the Doctor ſuſpected that what he had examined might derive moſt of its properties from the oil of vitriol, and rather be vitriolic than vegetable acid air.

174 Phlogiſticates common air.

An acid air, ſomewhat different from any hitherto deſcribed, was obtained by Dr Prieſtley from the vapour ariſing on diſtilling to dryneſs a ſolution of gold in marine acid impregnated with nitrous acid vapour, which makes the beſt kind of aqua regia. "The produce (ſays he) was an acid air of a very peculiar kind, partaking both of the nature of the nitrous and marine acids; but more of the latter than of the former, as it extinguiſhed a candle; but it was both extinguiſhed and lighted again with a moſt beautiful deep blue flame. A candle dipped into the ſame jar with this kind of air went out more than 20 times ſucceſſively, making a very pleaſing experiment. The quantity of this acid air is very great; and the reſiduum I have ſometimes found to be dephlogiſticated, ſometimes phlogiſticated, and at other times nitrous air."

175 Air from ſolution o gold.

SECT. XI. *Of Hepatic Air.*

THIS ſpecies of air, firſt particularly taken notice of by Mr Bergman, who obtained it from an ore of zinc

167
Produced firſt from an ore of zinc.

177
Beſt obtained from hepar ſulphuris.

zinc called *Pſeudogalena nigra Dannemorenſis*, and which was found to contain 29 parts of ſulphur, one of regulus of arſenic, ſix of water, ſix of lead, nine of iron, 45 of zinc, and four of ſiliceous earth. The hepatic air was produced but in ſmall quantity by pouring oil of vitriol on this mineral; ſpirit of ſalt produced it in much larger quantity; but nitrous acid produced only nitrous air. The moſt proper method of obtaining this air is by pouring marine acid on hepar ſulphuris, which extricates it in vaſt quantity. It is ſaid alſo to be ſometimes produced naturally from putrefying matters. It is the characteriſtic of all livers of ſulphur, whether they be made with alkalis or earths. The ſmell of the pure gas is intolerable; and the vapour has a diſagreeable effect on many metallic ſubſtances, particularly ſilver, lead, copper, &c. deſtroying their colour, and rendering them quite black. It is ſuddenly fatal to animal life, renders ſyrup of violets green, and is inflammable, burning with a very light blue flame. It is decompoſed by vitriolic and nitrous air, by dephlogiſticated air, and by the contact of atmoſpherical air, in which caſe it depoſits a ſmall quantity of ſulphur; being indeed, as is ſuppoſed by Mr Bergman and Mr Kirwan, no other than ſulphur kept in the aërial form. Its ſpecific gravity, compared with that of atmoſpherical air, is as 1106 to 1000. It combines readily with water, and gives the ſmell to the ſulphureous medicinal waters. Its great attraction for ſome of the metals and their calces makes it the baſis of ſome *Sympathetic* INKS. See alſo CHEMISTRY, (*Index*.)

SECT. XII. *Of Atmoſpherical Air.*

178
Proportion of the two ingredients of which it is compoſed.

THE two component parts of our atmoſphere, viz. dephlogiſticated and phlogiſticated air, have been ſo fully treated of under their reſpective ſections, that little remains to be ſaid in this place, excepting to determine the proportion in which they are uſually met with in the common air. The only regular ſet of experiments which have been made on this ſubject are thoſe of Mr Scheele. He conſtructed an eudiometer, conſiſting of a glaſs receiver, which could contain 34 ounces of water, and a glaſs cup containing a mixture of one pound of iron-filings and an equal weight of flowers of ſulphur moiſtened; which cup ſtanding upon a glaſs ſupporter, was inſerted in the former receiver, which, when this was in it, could contain 33 ounces of water. To the outſide of the glaſs tube or receiver, was affixed a ſlip of paper, to the height of a third of the tube, containing 11 diviſions, each correſponding to one ounce of water. This paper was varniſhed over with oil varniſh, to prevent its being ſpoiled by water. The whole then was placed in water, which gradually roſe as the air was diminiſhed. This mixture would ſerve four times before the power of diminiſhing air was loſt. He carefully compared the height of the air therein with the barometer and thermometer, both before and after the experiment; in eight hours the experiment was completed. With this inſtrument he examined the goodneſs of the common air in Stockholm every day for a whole year, and found the diminution never to exceed $\frac{10}{33}$, nor to fall ſhort of $\frac{8}{33}$; ſo that upon a medium it may be eſtimated at $\frac{9}{33}$. During the months of January and February it was $\frac{9}{33}$. The 23d of March it was $\frac{8}{33}$, though the cold increaſed, and the barometer ſtood higher than before. The 19th of April it was $\frac{10}{33}$, though the barometer and thermometer did not vary, and ſo ſtood till the 21ſt. In May and June it ſtood between $\frac{8}{33}$ and $\frac{9}{33}$. The 30th of July it ſtood at $\frac{10}{33}$. From the 3d to the 15th of September at $\frac{9}{33}$. The 6th of October at $\frac{10}{33}$, during a high ſtorm; but after it ſtood between $\frac{8}{33}$ and $\frac{9}{33}$, till the 4th of November, when it fell to $\frac{8}{33}$, and continued between $\frac{8}{33}$ and $\frac{9}{33}$ to the 20th, when it roſe to $\frac{10}{33}$. The 21ſt it fell to 8, and ſtood between $\frac{8}{33}$ and $\frac{9}{33}$ till the 8th of December, when it roſe to $\frac{9}{33}$; and from thence to the 31ſt it ſtood between $\frac{8}{33}$ and $\frac{9}{33}$.

As it has already been ſhown that the pure dephlogiſticated part of the atmoſphere is entirely conſumed by phlogiſtic proceſſes, ſuch as that of fermenting brimſtone and iron-filings, this eudiometer muſt be conſidered as an exact teſt of the proportion of dephlogiſticated air contained in the atmoſphere. The ſmall variation in the quantity ſhows, that the proceſſes in nature which deſtroy this air, are nearly balanced by thoſe which produce it; though it muſt appear ſurpriſing, that both theſe fluids, ſo extremely different, ſhould be produced at all ſeaſons of the year in a proportion nearly equal; nor is it leſs ſurpriſing that two fluids of unequal ſpecific gravity ſhould remain incorporated together without any tendency to ſeparate, which it is certain they never do, either in the atmoſphere itſelf, or when confined in veſſels in any quantity whatever.— As phlogiſticated air is ſomewhat lighter than dephlogiſticated, it might be ſuppoſed that the former would occupy the higher regions of the atmoſphere in ſuch a manner as to render them conſiderably more unwholeſome than the lower parts; but this ſeems not to be the caſe; On the contrary, it appears by experiments with the eudiometer, that the upper parts of the air contain a greater proportion of dephlogiſticated air than thoſe near the earth. See EUDIOMETER.

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Upper regions of the air more ſalubrious than the lower.

SECT. XIII. *Of the artificial Production of Airs of different Kinds.*

§ 1. *FIXED Air*, or *Aërial Acid*. The artificial methods of producing this are principally three, viz. by fermentation, by heat, and by acids.

(1.) *By fermentation*. When vegetable or animal ſubſtances, eſpecially the former, are fermented, they yield a great quantity of fixed air. In breweries, on the ſurface of the fermenting liquor, there is always a ſtratum of fixed air reaching as high as the edge of the vats; ſo that if theſe veſſels are deep, and the fermenting liquor much below their edges, the above-mentioned ſtratum may be ſome feet in thickneſs. The ſame phenomenon is obſervable in the fermentation of wines in general; and it is owing to the production and elaſticity of fixed air, that fermenting liquors, when put into cloſe veſſels, often burſt them with great violence. The caſe is the ſame whatever ſubſtance it is that undergoes the vinous fermentation, though the quantity of fixed air produced is not the ſame in all ſubſtances, nor even in the ſame ſubſtance at different times. From 42 cubic inches of beer Dr Hales obtained 639 cubic inches of air in 13 days. From a quantity of ſugar undergoing the vinous fermentation, Mr Cavendiſh obtained ſo much fixed air, that out of 100 parts of the former 57 appeared to have been volatilized and converted into fixed air.

But though a vaſt quantity of fixed air eſcapes during this proceſs of fermentation, a very conſiderable portion ſtill remains united with the fermented liquor, and to this it owes all its briſkneſs and agreeable pungent acidulous taſte; for when the fixed air is totally evaporated, the liquor becomes entirely vapid and flat. Hence alſo we are furniſhed with a method of reſtoring the briſkneſs of theſe liquors after they have loſt it in conſequence of being expoſed to the atmoſphere, viz. by impregnating them again with fixed air, either naturally or artificially produced.

Dr Prieſtley has made ſeveral experiments in order to determine the quantity of fixed air contained in ſeveral ſorts of wine. His method was to take a glaſs phial (fitted with a ground ſtopple and tube), capable of containing 1½ ounce-meaſure. This he filled with wine, plunging it into a proper veſſel of water. The whole was then put over the fire, and the water, into which the phial was plunged, ſuffered to boil. The end of the tube being placed under the mouth of an inverted receiver filled with quickſilver, the heat expelled the fixed air from the wine, which entering into the receiver, aſcended in bubbles through the quickſilver to the top, puſhing out part of the metal and taking its place. The reſult of his experiments was as follows:

1½ oz. meaſure of	Madeira	contained of pure fixed air	$\frac{1}{100}$	of an ounce meaſure.
	Port of ſix years old		$\frac{1}{48}$	
	Hock of five years		$\frac{1}{24}$	
	Barrelled claret		$\frac{1}{12}$	
	Tokay of 16 years		$\frac{1}{20}$	
	Champagne of 2 years		2 oz. meaſures.	
	Bottled cyder of 12 years		3¼ ditto.	

During the acetous fermentation alſo, liquors emit a vapour, great part of which is fixed air, though the nature of its other component parts has not yet been thoroughly aſcertained.

Fixed air is likewiſe produced, though in no great quantity, by putrefaction. In this caſe, however, a great part of the elaſtic fluid conſiſts of inflammable and phlogiſticated air, and the fixed air itſelf ſeems to be intimately connected with a putrid offenſive effluvium. It ſeemed to Dr Prieſtley to "depend in ſome meaſure upon the time and other circumſtances in the diſſolution of animal or vegetable ſubſtances, whether they yield the proper putrid effluvium, or fixed or inflammable air."

The elaſtic fluid produced by putrefying vegetables, when kept in a moderate degree of heat, is almoſt all fixed air; while that from animal ſubſtances contains ſeveral times more inflammable than fixed air. Vegetable ſubſtances yield almoſt all the permanently elaſtic fluid in a few days, but animal bodies continue to emit it for ſeveral weeks. When the elaſtic fluid yielded by animal ſubſtances is abſorbed by water, and that water boiled, the fixed air may then be obtained without any mixture of the putrid effluvium. It is alſo to be obſerved, that the quantity of elaſtic fluid producible from animal ſubſtances is various according to the nature of the parts of the animal employed. Thus the muſcular parts will yield leſs elaſtic fluid, and alſo leſs mixed with any putrid or offenſive effluvium, than a whole animal, or than the liver, &c. The proportion of inflammable and of fixed air is alſo various, according to the various parts employed.

(2.) *By heat.* In every combuſtion, except that of ſulphur or of metals, a quantity of fixed air is generated. This may be obſerved by fixing a lighted candle in an inverted receiver over a baſon of lime-water, for a precipitation of the lime will preſently enſue; and the ſame precipitation (which is one of the characteriſtics of fixed air) will always enſue, whether a candle, a burning piece of wood, or, in ſhort, any other combuſtible ſubſtance, except ſulphur or metals, be made uſe of.

During this production or extrication of fixed from atmoſpherical air, the latter is commonly ſuppoſed to be conſiderably diminiſhed, though Mr Lavoiſier and Mr Scheele have now rendered that opinion doubtful. If a piece of charcoal be burned by throwing the focus of a lens upon it when contained in a glaſs-receiver inverted in water, after the apparatus is cooled, the water will have mounted a ſmall way into the receiver. The diminution, however, is limited, and depends on ſeveral circumſtances. Dr Hales has obſerved, that, in equal receivers, the air ſuffers a greater diminution by burning large candles than ſmall ones; and likewiſe that, when equal candles are made uſe of, the diminution is greater in ſmall than in large receivers. The cauſe of this phenomenon probably is, that the air contained in the receiver cannot all come into contact with the flame of the candle; whence, as ſoon as the air which is neareſt the flame becomes contaminated, the candle is extinguiſhed. Thus the author of a Conciſe Treatiſe on the Various Kinds of Permanently Elaſtic Fluids, has diminiſhed the air of an inverted receiver one ſixth part, by moving the candle whilſt it burned through the different parts of the veſſel, ſo that the flame was brought into contact with a greater quantity of the confined air than if it had remained in one ſituation till it became extinct. Dr Mayow obſerved, that by the burning of a candle the air was diminiſhed of one thirtieth only; Dr Hales found it to be diminiſhed of one twenty ſixth part; and Dr Prieſtley found it to be diminiſhed of one fifteenth or ſixteenth. Mr Cavendiſh obſerved that air ſuffered a diminution of one tenth of the whole quantity, by paſſing through an iron-tube filled with red-hot powder of charcoal. A candle or any other combuſtible body, will ceaſe to burn by itſelf, and conſequently to contaminate a quantity of confined air much ſooner than when it is in ſome manner forced to burn by the external application of heat. "The focus of a burning mirror," ſays Dr Prieſtley, "thrown for a ſufficient time either upon brimſtone or wood, after it has ceaſed to burn of its own accord, and has become charcoal, will have a much greater effect of the ſame kind, diminiſhing the air to its utmoſt extent, and making it thoroughly noxious." The combuſtion of the phoſphorus of urine diminiſhes air in a great degree. Mr Lavoiſier has obſerved, that by the combuſtion of phoſphorus, air may be diminiſhed of about one-fifth or one-ſixth. This accurate philoſopher has alſo obſerved, that the acid of phoſphorus thus formed, acquires the weight loſt by the diminiſhing air; finding that about three inches of air were abſorbed by every one grain of phoſphorus, when the experiment was tried with a receiver inverted in water, upon the ſurface of which a ſmall quantity of oil had been introduced; but when the receiver was inverted in quickſilver, the abſorption was conſtantly between two one-fourth and two three-fourth inches for each grain. Mr Cavallo mentions his having often repeated the experiment of burning phoſphorus in a glaſs tube inverted in water, by applying the cloſed part of the tube, wherein the phoſphorus was contained, to a pretty ſtrong fire, when he always obſerved that the utmoſt diminution of the incloſed air effected by this means was full one-fifth.

Dr Hales remarked, that after the extinction of candles in a receiver, the air continued to diminiſh for ſeveral days after. This may be owing to the gradual abſorption of part of it by the water; it having been remarked by Dr Prieſtley, "that this diminution of air by burning is not always immediately apparent, till the air has paſſed ſeveral times through water; and that when the experiment was made with veſſels ſtanding in quickſilver inſtead of water, the diminution was generally inconſiderable till the air had paſſed through water."

In theſe experiments of burning combuſtible bodies in a quantity of air, and meaſuring the diminution, we ſhould always remark two cauſes of miſtake, viz. the abſorption of air by the coaly reſiduum of the burned matter, which ſometimes is very conſiderable, or by the fluid in which the receiver is inverted, and the production of elaſtic fluid from the burning ſubſtances; thus gunpowder generates a great quantity of elaſtic fluid when inflamed, &c.

Even the electric ſpark ſeparates fixed air from common atmoſpherical air; for when a number of theſe ſparks are taken in a ſmall quantity of common air over lime-water, a diminution will take place, the lime will be precipitated, and if we put a blue vegetable juice inſtead of the lime-water, it will be turned red by the acidity of the fixed air depoſited upon it. Dr Prieſtley having cemented a wire into one end of a glaſs tube, the diameter of which was about one-tenth of an inch, and having fixed a braſs ball to that extremity of the wire which was out of the tube, filled the lower part of it with the juice of turnſole or archil, ſo that a quantity of common air was contained in the tube between the extremity of the wire and the ſurface of the liquor. Then taking the electric ſparks between the ſaid wire and liquor for about one minute, the upper part of the liquor began to look red, and in about two minutes it was manifeſtly ſo. The air, at the ſame time, was diminiſhed in proportion as the liquor became red; but when the diminution arrived to be one-fifth of the quantity of the air contained, then a longer electrization produced no ſenſible effect. "To determine," ſays the Doctor, "whether the cauſe of the change of colour was in the air or in the electric matter, I expanded the air which had been diminiſhed in the tube by means of an air-pump, till it expelled all the liquor, and admitted freſh blue liquor in its place; but after that, electricity produced no ſenſible effect, either on the air or on the liquor; ſo that it was evident that the electric matter had decompoſed the air, and had made it depoſite ſomething that was of an acid nature."

The calcination of metals, as already obſerved, phlogiſticates, and conſequently diminiſhes common air; but does not produce any fixed air, ſince the lime-water, over which the calcination is made, does not become turbid; and when metallic calxes are expoſed to a ſufficiently ſtrong heat, they in general yield ſome fixed air: ſo that it ſeems that the fixed air which is formed in the act of the calcination of metals is abſorbed by the calx. Some fixed air may be obtained from red lead, by no greater degree of heat than that of the flame of a candle applied to the phial that contains it.

180 Obtained from earths by means of heat. The calcareous earths, which, when acted on by acids, yield a vaſt quantity of fixed air, produce a very ſmall quantity of it when expoſed to a ſtrong heat by themſelves, in a proper veſſel, even when expoſed to the focus of a lens. Dr Prieſtley, in his experiments relating to the production of dephlogiſticated air from various ſubſtances, when moiſtened with nitrous acid, and afterwards expoſed to a ſufficient degree of heat, generally found that ſome fixed air was produced together with the dephlogiſticated air; but often obtained fixed air only, without any dephlogiſticated air being mixed with it, or fixed and nitrous air together. From half an ounce of ruſt of iron, moiſtened with ſpirit of nitre, and dried, he obtained about a quart of elaſtic fluid, about one-third of which was fixed and the reſt nitrous air. From aſhes of pit-coal, treated in the ſame manner, he obtained nearly the like reſult. But in thoſe experiments, the Doctor moſtly uſed a gun-barrel, into which he introduced the ſubſtances to be tried; ſo that it is very probable, as he juſtly obſerves, that the iron might have contributed to the formation of the fixed air. In fact, when he tried ſubſtances of the ſame ſort, firſt in a gun-barrel and then in glaſs veſſels, he obtained much more fixed air in the former than in the latter caſe. One of thoſe experiments he made with tobacco pipe-clay, which, after being moiſtened with ſpirit of nitre, was when dry expoſed to the fire in a gun-barrel, and yielded ſome elaſtic fluid, which appeared to be wholly fixed air; but repeating the experiment in a glaſs-phial with a ground ſtopple, and taking the produced elaſtic fluid at eight different times, found that on the beginning ſome fixed air was produced, but afterwards the produce was dephlogiſticated air. He made a ſimilar experiment with flints carefully calcined in cloſe veſſels, and obtained a ſimilar reſult.

181 From different minerals. Moſt minerals contain fixed air, which may be extracted to a certain degree by means of heat. Mr Krenger, diſtilling a greeniſh fuſible ſpar, which was luminous in the dark, obtained from it ſome permanently elaſtic fluid, which, like fixed air, cryſtallized a ſolution of fixed alkali. Mr Fontana, in his analyſis of the malachite, finds that that mineral contains a vaſt quantity of fixed air, as pure as that which is extracted from chalk by means of vitriolic acid.

From almoſt every metallic ore or earthy mineral ſome fixed air may be obtained, as well as from chalk, lime-ſtone, marble, marine ſhells, fixed and volatile alkali, and from magneſia alba, by means of a violent fire, or of acids.

In Mr Boyle's, Dr Boerhaave's, and Dr Hales's works, and in other books, the quantities of elaſtic fluid generated in various proceſſes, and by divers ſubſtances, are mentioned with diſtinction; but as thoſe writers were not acquainted with the characteriſtic properties of fixed air, we do not know whether the elaſtic fluid mentioned by them was pure fixed air or not.

From animal ſubſtances, mixed with ſpirit of nitre, and ſometimes heated a little, in order to facilitate the production of elaſtic fluid, Dr Prieſtley obtained, in general, fixed air; but whereas the fixed air produced by a ſimilar proceſs with vegetable ſubſtances is moſtly mixed with nitrous air, this is mixed with an elaſtic fluid, which is ſeldom nitrous in a very ſlight degree, but is often phlogiſticated air, viz. in ſuch a ſtate as extinguiſhes a candle, does not diminiſh common air, nor is itſelf diminiſhed by nitrous air. Towards the end of the proceſs, the Doctor remarks, "that when, by means of a ſtrong heat, the produce of air is very rapid, and the air full of clouds, it is, like air, produced from vegetable ſubſtances in the ſame circumſtances, ſlightly inflammable, burning with a lambent, greeniſh, or bluiſh flame."

182 Abundantly produced from calcareous ſubſtances.

(3.) *By acids.* Calcareous ſubſtances in general produce abundance of fixed air when acted upon by any acid, only the ſtrongeſt acids will expel from them more fixed air than the weakeſt; and it happens to be peculiarly advantageous for thoſe who want to produce a great quantity of fixed air, that the vitriolic acid is both the cheapeſt and ſtrongeſt acid, and, upon the whole, the fitteſt for this purpoſe. The phenomena attending the production of fixed air from calcareous ſubſtances, &c. are themſelves very remarkable, and furniſh the ſubject of much ſpeculation in philoſophy. —The principal facts are the following. 1. When calcareous earths, alkalis, and magneſia, in their uſual ſtate, are mixed with acids, they cauſe an effervеſcence; and conſequently the production of a permanently elaſtic fluid, namely, fixed air. 2. Theſe ſubſtances retain the fixed air very obſtinately; ſo that a ſtrong fire is neceſſary to expel it from magneſia, and the ſtrongeſt is not ſufficient to expel it entirely from fixed alkalis, and eſpecially from calcareous earths (A). When theſe ſubſtances are treated with acids, they yield the fixed air, becauſe they have a ſtronger attraction to thoſe acids than to the fixed air. 3. The calcareous earths which are inſoluble in water, when deprived of the fixed air, become ſoluble in it. Thus lime-ſtone is not ſoluble in water, but lime (viz. lime-ſtone deprived of its fixed air) is ſoluble in water. And if thoſe ſubſtances, deprived of their fixed air, are put into a ſituation proper to recover their loſt fixed air, they loſe the property of being ſoluble in water. Thus, when lime-water is expoſed to fixed air, the lime abſorbs the fixed air; and, loſing at the ſame time its property of being ſoluble in water, is precipitated from it in the ſtate it was before calcination, viz. of a calcareous earth inſoluble in water, and capable of effervеſcing with acids. 4. Alkalis, both fixed and volatile, when deprived of their fixed air, become more cauſtic, and more powerful ſolvents, incapable of cryſtallization, and of effervеſcing with acids. But if to thoſe alkalis, and alſo earths rendered more cauſtic, their fixed air be reſtored, they acquire at once all the properties they had before they were deprived of the fixed air, viz. they become more mild, effervеſce with acids, recover their weight, &c.

Thoſe properties of calcareous earths and alkalis were aſcertained by the learned Dr Black, who performed a variety of deciſive and well-contrived experiments, upon which he formed a juſt theory, viz. that the cauſticity, ſharpneſs, ſolubility, &c. of thoſe ſubſtances, was owing to the fixed air being expelled from them; and that when they were combined with a proper quantity of fixed air, they were mild, &c. The Doctor gives the epithet of *mild* to thoſe ſubſtances when they are combined with air, and of *cauſtic* when deprived of it; as cauſtic calcareous earth, cauſtic fixed alkali, &c. Among the other experiments, he connected two phials by means of a bent tube; in one of which he put ſome cauſtic ſpirit of ſal-ammoniac, and in the other ſome mild alkali, or mild calcareous earth; then pouring, through a hole made in the ſide of the latter phial, ſome acid upon the mild alkali, ſo as to produce ſome fixed air, which paſſing through the tube into the other phial, combined with the ſpirit of ſal-ammoniac, and rendered it mild.

Eaſy methods of obtaining Fixable Air for occaſional Experiments, &c.

(1.) *By Fermentation.* Mix together equal parts of brown ſugar and good yeſt of beer, to which add about twice the bulk of water. This mixture being put into a phial, to which a bent tube with a cork may be adapted, will yield a conſiderable quantity of fixed air, which may be received into a phial filled with quickſilver or water, as in the following proceſs.

Plate X. fig. 1.

(2.) *By Acids.* Let a glaſs tube, open at both ends, be bent, by means of a blow-pipe and the flame of a candle, nearly in the ſhape of an S, as it is repreſented by AB, and fix a cork D to one of its extremities, ſo as to fit the neck of a common phial, that may hold about four or five ounce-meaſures. The hole through the cork may be made with an iron wire red-hot, and the tube may be faſtened in it with a bit of ſoft wax, ſo as not to let any air go through. Fill a ſimilar phial, or any glaſs receiver K, with water, and invert it after the manner ſhown above, in a baſon HI, about half filled with water. Now put ſome chalk or marble, groſsly powdered, into the bottle E, ſo as to fill about a fourth or fifth part of it, and upon it pour ſome water, juſt enough to cover the chalk; then add ſome oil of vitriol to it, which needs not be more than about the fourth or fifth part of the water. Immediately after, apply the cork D, with the tube AB, to the bottle, and putting it in the ſituation FG, let the extremity B of the tube paſs through the water of the baſin into the neck of the bottle K, which now muſt be kept up with the hand, or other convenient ſupport, as it cannot reſt upon the bottom of the baſin. The mixture of chalk, &c. in the bottle FG, will immediately begin to effervеſce, ſhowing a frothing, and an inteſtine motion accompanied with heat, that may be felt by applying the hand to the outſide of the fluid. The elaſtic fluid called *fixed air* is copiouſly emitted from this mixture, and paſſing through the bent tube, will go into the bottle K, as appears by the bubbles which come out of the tube, and, paſſing

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(A) Chalk, lime-ſtone, &c. after being kept in a very ſtrong fire for many hours, if they are put into acids, yield a conſiderable quantity of fixed air; which ſhows that the pureſt quick-lime contains ſome fixed air.

ſing through the water, aſcend to the top of the inverted bottle. In proportion as the elaſtic fluid fills the bottle K, the water gradually deſcends, and at laſt is quite expelled from it; the bottle K then is filled with fixed air, and being corked under water, may be removed from the baſin, and kept for uſe. Another bottle may then be filled with water, and may be inverted over the extremity of the bent tube in the place of K, which other bottle may be filled in a ſimilar manner, and ſo on till the mixture in FG has finiſhed to yield any fixed air.

If one of theſe bottles filled with fixed air be uncorked, and, holding it with the mouth upwards, a lighted wax taper, bent like L, or a ſmall piece of it affixed to the extremity of a wire, be immediately let down in it, the flame will be inſtantly extinguiſhed. The ſame thing will happen if a lighted piece of wood is let down in it.

Take a clean bowl, and putting the mouth of a bottle, filled with fixed air, in it, uncork it, and keep it in that ſituation for about a minute. The fixed air being ſpecifically heavier than common air, will come out of the bottle, and will remain at the bottom of the bowl, whilſt common air enters into the bottle; which bottle may now be removed; and, in order to ſhow the real exiſtence of the fixed air, which will immediately ſhow its being heavier than common air, put a lighted wax-taper into the bowl, pretty near its bottom, which taper will be extinguiſhed immediately. The air in this experiment muſt be agitated as little as it is poſſible. That the flame of the wax taper was really extinguiſhed by the fixed air, may be eaſily proved in the following manner:—Blow once or twice into the bowl, by which means the fixed air will be expelled from it; and then, on letting down a lighted wax-taper in it as before, it will be found that it is no longer extinguiſhed, but will burn very well, the bowl being now filled with common air. This experiment never fails of ſurpriſing the ſpectators, as it clearly exhibits two remarkable properties of a fluid, which they can neither ſee nor diſtinguiſh by the feeling.

Cavallo on Air.

When the bottle K is about half filled with fixed air, put a mark with a bit of ſoft wax on the outſide of it, juſt coinciding with the level of the water in it, and immediately after ſhake the bottle; but taking care that its mouth be not lifted above the ſurface of the water in the baſin. After having ſhaked it for about a minute, on intermitting the agitation, it will be found that the water is above the mark; which ſhows that ſome of the fixed air has been abſorbed by it. Let this abſorption be carried on as far as poſſible, by agitating the bottle repeatedly, and allowing time to let more fixed air be produced and enter into the bottle in proportion as the water abſorbs it. Then apply the hand, or a finger, to the mouth of the bottle whilſt under water; bring the bottle out, and turn it with the mouth upwards. The water then will be found to have acquired a pleaſant acidulous taſte. The water thus impregnated with fixed air changes the blue infuſion of ſome vegetable ſubſtances into red; ſo that if a weak ſolution of heliotrope is mixed with it, or indeed if it is ſimply expoſed to fixed air, the liquor acquires a reddiſh appearance. It alſo corrodes iron, and ſome other metals, much more eaſily than common water. But the greateſt and moſt uſeful property of this acidulated water, or water impregnated with fixed air, is its being a powerful antiſeptic. As the moſt uſed mineral waters are medicinal principally on account of their being impregnated with fixed air, beſides which they generally contain ſome ſmall portion of metal or ſalt diſſolved; they may be imitated by impregnating water with fixed air, and then adding that quantity of ſalt or of metal, that by analyſis the original mineral waters are found to contain.

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Uſeful properties of fixed air.

It is for its great property of hindering putrefaction, that fixed air by itſelf, or incorporated with various fluids, eſpecially with water, and that vegetables, ſugar, and other ſubſtances which abound with fixed air, are very powerful remedies in putrid diſeaſes. Sir John Pringle ſuppoſes, with great probability, that the frequent uſe of ſugar and freſh vegetables, which at this time make up a conſiderable part of the diet of the European nations, prevents thoſe putrid diſeaſes and plagues which formerly were rather frequent.—Dr Macbride, ſhowing experimentally that fixed air is diſcharged by ſuch ſubſtances as form our common food, aſcribes the preſervation of the body from putrefaction in a great meaſure to the fixed air, which in the ordinary proceſs of digeſtion is diſengaged from the aliment, and incorporates with the fluids of the body.

From the ſame property it may be alſo uſefully applied to ſeveral œconomical purpoſes. Mr Henry found, that fixed air can preſerve fruit for a conſiderable time. He tried a bunch of Italian grapes, which being ſuſpended in the middle part of Dr Nooth's apparatus, and being ſupplied with plentiful ſtreams of fixed air every day, was preſerved without any ſigns of decay for about one month longer than a ſimilar bunch ſuſpended in a decanter containing common air. Strawberries and cherries he alſo found to be preſerved without decay ſome days longer in fixed than in common air. Indeed, fixed air preſerves not only fruit, but reſiſts putrefaction in general. Dr Macbride, in his elegant Eſſays on Medical and Philoſophical Subjects, has publiſhed various experiments which demonſtrate this property of fixed air. He found, that not only good meat was preſerved incorrupt for a conſiderable time, when expoſed to fixed air; but that the putrefaction of ſubſtances actually putrid was impeded by this means, and even that thoſe ſubſtances were reſtored from the putreſcent to a ſound ſtate. That putrefaction was checked by fermentation, was diſcovered by Sir John Pringle; and Dr Macbride obſerved, that this effect was owing to the fixed air produced in the act of fermentation. But it muſt be obſerved, that when the ſound, or even putrid ſubſtances, expoſe a very great ſurface to the fixed air, as is the caſe with milk, bile, and other fluids impregnated with fixed air, and alſo with ſmall bits of meat, then they are preſerved for a conſiderable time: but large pieces of ſolid animal ſubſtances, as for inſtance roundiſh pieces of fleſh of about half a pound weight, do not ſeem to remain incorrupt much longer in fixed than in common air; at leaſt the difference is inconſiderable. Sir William Lee, baronet, in two of his letters to Dr Prieſtley, informs him of his having found, that fleſh-meat, even in the hot ſeaſon, could be preſerved wholeſome for ſeveral days, by only waſhing it two or three times a-day in water impregnated with fixed

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Reſiſts putrefaction.

fixed air. "We have been enabled," ſays he, "to preſerve meat as perfectly ſweet and good to the extent of ten days, as at the firſt killing; and there ſeems no doubt it might be preſerved much longer." He has even recovered ſome meat that had begun to change. This uſeful diſcovery, Sir William juſtly obſerves, may be very beneficial to the public, eſpecially to butchers. "Particularly a butcher," ſays he, "who deals pretty largely, aſſures me he found the greateſt ſucceſs from it, and only objects that the veal was a little diſcoloured, though kept perfectly ſweet."

Fixed air, as it combines with water, ſo it may be combined with other liquors. Beer, wine, and other fermented liquors, may be impregnated with fixed air, and by this means their ſharpneſs may be reſtored, when they are become vapid, or, as it is commonly ſaid, *dead*. The acidulous taſte communicated by the impregnation of fixed air, cannot be diſcovered in beer, wines, and, in ſhort, in ſuch liquors which have much taſte of their own. Milk acquires an acidulous taſte by being impregnated with fixed air, and is thereby preſerved incorrupt for ſome days; which affords a very eaſy expedient of preſerving milk in thoſe places where it cannot be had new very often.

185 Production of inflammable air. § 2. *To produce* INFLAMMABLE *Air*.—The proceſs for making this ſort of gas is the ſame as that for making fixed air: one of the materials only muſt be different, viz. iron-filings, or groſsly powdered zinc, muſt be uſed inſtead of chalk; to which filings ſome oil of vitriol and water muſt be added, in the ſame proportion as in the fixed air, or rather a little more of oil of vitriol.

N.B. Inſtead of the filings of iron, ſmall nails, or ſmall bits of iron-wire, anſwer equally well.

The inflammable elaſtic fluid produced by this mixture has a diſpleaſing ſmell, even when mixed with a very large quantity of common air; ſo that if any conſiderable quantity of it comes out of the bottle, before the cork with the bent tube be applied to it, &c. its ſmell may be perceived all over the room in which the experiment is made, but this ſmell is not particularly offenſive.

When a bottle has been filled with this elaſtic fluid, ſtop the mouth of it with your thumb, or any ſtopper, and taking it out of the baſin, bring it near the flame of a candle; and when the mouth of the bottle is very near it, remove the ſtopper, and the elaſtic fluid contained in the bottle will be immediately inflamed; and if the capacity of the bottle is nearly equal to four ounce-meaſures, it will continue burning quietly for about half a minute, the flame gradually deſcending lower and lower, as far as about the middle of the bottle, in proportion as the inflammable gas is conſumed.

In this experiment we ſee, that inflammable air follows the general rule of all other combuſtible ſubſtances, namely, that of burning only when in contact with common air: thus the flame of this gas, whilſt burning, is obſervable only on that ſurface of it which is contiguous to the common air; ſo that if the bottle
186 Phenomena. be cloſed, the flame is put out immediately, becauſe the air is intercepted from it. But if the inflammable air were put in ſuch a ſituation as to expoſe a very great ſurface to the common air, it is plain that by this means its combuſtion would be accelerated, ſo as to let it burn inſtantly, and go off with an exploſion, cauſed by the ſudden rarefaction of the air. In fact, this effect may be eaſily obſerved in the following manner: When the bottle is to be inverted into the baſin, in order to let it be filled with the inflammable gas, inſtead of filling it entirely with water, let half of it remain filled with common air; then invert it, and let the other half, which is now filled with water, be filled with inflammable air after the uſual manner; and when the bottle is full, remove it in the manner ſhown above, and approach it to the flame of the candle, by which means the inflammable air takes fire; but now it explodes all at once with a large flame and a conſiderable report, ſometimes breaking the bottle in which it is contained. In this caſe, the bottle being filled with equal parts of inflammable and common air, theſe two elaſtic fluids were mixed together, ſo that almoſt every particle of the one touched every particle of the other, and hence the ſudden combuſtion was occaſioned. The force of this exploſion is ſo very conſiderable, that ſome piſtols have been contrived, which are charged with a mixture of air and inflammable gas, and being fired by means of an electric ſpark, are capable of driving a leaden bullet with great violence. Sometimes thoſe piſtols are made of glaſs (but in this caſe they are not charged with a bullet), and it is very diverting to ſhow that piſtols are charged and explode by the combuſtion of an inviſible ſubſtance.

When a ſlender pipe is tied to the neck of a bladder, and the bladder is filled with inflammable air, after the manner deſcribed in the preceding experiment (viz. when the bladder was required to be filled with fixed air), two very pleaſing experiments may be performed with it. Firſt, the inflammable gas may be inflamed by applying the flame of the candle to the extremity of the pipe; and ſqueezing at the ſame time the bladder, a ſtream of fire will be formed in the air, which will laſt as long as the bladder contains any inflammable air; for this gas coming out of the pipe with violence, will continue inflamed for a conſiderable way in the air. Secondly, the extremity of the pipe may be dipped into a ſolution of ſoap, then removing it from the ſolution, and ſqueezing the bladder very gently, a ball of ſoap-water may be formed, including inflammable air: which ball, on account of the inflammable gas being much lighter than common air, as ſoon as it is detached from the pipe will aſcend upwards, and will break by daſhing againſt the ceiling, contrary to thoſe commonly made by children, which in ſtill air go downwards.—Whilſt the ball is aſcending, if the flame of the candle be approached to it, the film of ſoap-water will be inſtantly broke, and the inflammable air will take fire; thus a flame may be ſhown to be ſeemingly produced from a ſoap-ball.

187 Inflammable air obtained from various ſubſtances. By taking electric ſparks in any kind of oil, ſpirit of wine, ether, or ſpirit of ſal-ammoniac, Dr Prieſtley obtained inflammable air. The oil, or other liquor, was confined in a glaſs tube by quickſilver, and a wire was cemented in the upper part of the tube, through which the ſparks being ſent, went to the quickſilver through the oil; but after that a few ſparks had been taken, a quantity of inflammable air was generated, &c. Leſt the production of inflammable air ſhould be attributed to the cement which faſtened

the wire, the Doctor repeated the experiment with ether in a glaſs ſyphon; but the inflammable air was generated as before. This elaſtic fluid does not loſe its inflammability by being paſſed ſeveral times from one veſſel into another through water.

Alkaline air, by taking electric exploſions in it, is changed into inflammable air.

By means of acids, inflammable air is obtained in greater abundance, and more readily. Iron, zinc, or tin, yield plenty of inflammable air when acted on by diluted vitriolic or marine acids.

If iron is put into ſtrong vitriolic acid, the quantity of elaſtic fluid that is produced is very little, except heat be applied to the phial, for then the production of elaſtic fluid is more copious; but this elaſtic fluid is vitriolic acid air, mixed with a ſmall portion of inflammable air, the proportional quantity of it being leſs when the acid is more concentrated.

Zinc, treated after the ſame manner, produces the like effects, except that it gives more elaſtic fluid, without the application of heat, than iron does; and the greateſt part of the produced elaſtic fluid is inflammable.

In order to obtain the greateſt quantity of inflammable air from iron or zinc, the vitriolic acid muſt be diluted with much water, as about one part of ſtrong oil of vitriol to five or ſix parts of water. Dr Prieſtley found, that 11 grains of iron yielded 8¼ ounce-meaſures of inflammable air. According to Mr Cavendiſh, one ounce of zinc, diſſolved either in the vitriolic or marine acid, yields a quantity of inflammable air equal to the bulk of 356 ounces of water; one ounce of iron, diſſolved by means of vitriolic acid, yields a quantity of inflammable air equal to the bulk of 412 ounces of water; and one ounce of tin yields half as much inflammable air as iron does.

The ſolutions of iron, tin, copper, lead, and zinc, in the marine acid, produce marine acid air, and inflammable air, but in various quantities. The proportion of the former to the latter is as one to eight in iron, as one to ſix in tin, as three to one in copper and lead, and as one to ten in zinc. Regulus of antimony, diſſolved in marine acid, with the application of heat, yields a ſmall quantity of elaſtic fluid, which is weakly inflammable.

Dr Prieſtley obtained inflammable air, not only by diſſolving various ſubſtances in marine acid, but alſo by expoſing divers bodies to marine acid air, which is probably the pureſt part of the marine acid. Having admitted iron filings to this acid air, they were diſſolved by it pretty faſt; half of the elaſtic fluid diſappeared, and the reſt was rendered unabſorbable by water, and inflammable. The ſame effect was produced by almoſt every ſubſtance which contains phlogiſton, as by ſpirit of wine, oil of olives, ſpirit of turpentine, charcoal, phoſphorus, bees-wax, ſulphur, dry cork-wood, pieces of oak, ivory, pieces of roaſted beef, and even ſome pieces of a whitiſh kind of flint.

A greater or ſmaller portion of the acid air was abſorbed, and the reſt ſometimes was all inflammable, and often was partly acid air, which was ſoon abſorbed on the admiſſion of water, and partly inflammable. In ſhort, it ſeems as if this acid air, having a great affinity with phlogiſton, ſeparates it from all thoſe ſubſtances which contain it even in ſmall quantity, and from that combination becomes inflammable.

By means of nitrous acid, inflammable air may be obtained from various ſubſtances containing phlogiſton; but it is always mixed with nitrous air, and ſometimes alſo with fixed and common or phlogiſticated air. If two parts of ſpirit of wine, mixed with one part of nitrous acid, are put into a phial with a ground-ſtopple and tube, and the flame of a candle be applied to it, ſo as to heat it gradually, the inflammable air will be produced very readily; the inflammability of which is, however, not very permanent, for by a little waſhing in water it may be annihilated. In the ſolution of moſt ſubſtances in nitrous acid, it generally happens, that the elaſtic fluid, which is obtained towards the latter end of the proceſs, poſſeſſes the property of being inflammable: thus iron, diſſolved in nitrous acid, yields nitrous air; but when the nitrous air ceaſes to be produced, if the heat of a candle be applied to the ſolution, more elaſtic fluid will be produced which is inflammable. "The nitrous acid (ſays Dr Ingenhouſz) when mixed with iron-filings in a very diluted ſtate, gives, by the aſſiſtance of a moderate degree of heat, a mixture of different airs, partly fixed, partly common air, and partly phlogiſticated air. See further the article AEROSTATION.

§ 3. *To produce* NITROUS *Air.*—This permanently elaſtic fluid is never found naturally, like fixed or inflammable air, but is entirely artificial.

188 Nitrous air is entirely artificial.

Either ſilver, copper, braſs, iron, mercury, biſmuth, or nickel, when mixed with nitrous acid, yield nitrous air in great quantities. Some of them, eſpecially mercury, require the aid of heat in order to produce the elaſtic fluid; the flame of a candle applied to the phial is ſufficient: but others, eſpecially copper and iron, do not want the application of any heat. Gold, platina, and the regulus of antimony, when put in aqua regia, yield nitrous air pretty readily. Among the metals, lead yields nitrous air in the ſmalleſt quantity. "I poured (ſays Dr Prieſtley) ſmoking ſpirit of nitre into a phial with a ground-ſtopple and tube, containing 1¼ ounce-meaſure filled with ſmall leaden ſhot, ſo as to leave no common air at all, either in the phial or in the tube; and I placed it ſo as to receive the air that might come from it in water. After waiting an hour, in which little or no air was produced, I applied the flame of a candle, though not very near, to it: and in theſe circumſtances I got about an ounce-meaſure of air; but upon ſome water ruſhing into the phial while the candle was withdrawn, air was produced very plentifully. I collected in all about a quarter of a pint; and might probably have got much more, but that the ſalt formed by the ſolution of the lead had ſo nearly cloſed up the tube, that I thought proper to diſcontinue the proceſs. The air, both of the firſt and of the laſt produce, was of the ſame quantity; and ſo far nitrous, that two meaſures of common air, and one of this, occupied the ſpace of two meaſures only; excepting that the very firſt and very laſt produce, mixed with common air, took up a little more room than that which I got in the middle of the proceſs. When the air was produced very faſt, it was exceedingly turbid, as if it had been filled with a white powder."

189 From what ſubſtances produced.

Among the ſemi-metals, zinc gives the weakeſt nitrous air, when diſſolved in nitrous acid. The elaſtic fluid produced from it is moſtly phlogiſticated air. From four pennyweights and 17 grains of zinc, diſſolved in ſpririt of nitre diluted with an equal quantity of water, Dr Prieſtley obtained about 12 ounce-meaſures of very weak nitrous air. It occaſioned a very ſlight efferveſcence when mixed with common air. The Doctor obtained nitrous air even from ſome flowers of zinc. "Having (ſays he) mixed a quantity of blue ſpirit of nitre with flowers of zinc, which were of a dull colour, and appeared from ſeveral experiments to contain a portion of phlogiſton, it yielded, with the heat of a candle applied to the phial which contained it, ſtrong nitrous air; when the common ſpirit of nitre, applied in the ſame manner, gave only phlogiſticated air; the phlogiſton of which came probably from the calx itſelf, though a ſmall portion of it might have been in the nitrous acid, which I believe is never entirely free from it."

The quantity of nitrous air that may be obtained from various metals, is difficult to be aſcertained, on account of the diverſity occaſioned by the ſtrength of the acid, the various nature of the metallic ſubſtance, and the method of performing the experiments. The following is a table of the produce of nitrous air from various metals, extracted from Dr Prieſtley's firſt volume of Experiments and Obſervations; but which, as the author himſelf intimates, is far from being very accurate.

dwt.	grs.		
6	0	of ſilver yielded	17½ ounce-meaſures.
5	19	of quickſilver,	4½
1	2½	of copper,	14½
2	0	of braſs,	21
0	20	of iron,	
1	5	of biſmuth,	6
0	12	of nickel,	4

The various ſtrength of the nitrous acid produces great diverſity in the production of nitrous air. Thus, if copper is diſſolved in ſtrong nitrous acid, it will not produce the leaſt quantity of nitrous air; but when diſſolved in diluted nitrous acid, it produces a great quantity of that elaſtic fluid. The ſtrong and pale-coloured nitrous acid ſhould be diluted with at leaſt two or three parts of water to one of the acid, for the eaſy production of nitrous air from copper and mercury.

The briſkneſs of the effervеſcence, and the production of nitrous air, are promoted by heat, and alſo by letting the metallic ſubſtance preſent a great quantity of ſurface to the acids.

For the generality of experiments, no other degree of heat is required than that produced by the effervеſcence itſelf, except mercury be uſed, which requires the application of ſome heat. When the metal exhibits a very great ſurface to the acid, as is the caſe when filings are uſed, the effervеſcence and production of nitrous air are often much quicker than can be conveniently managed.

Copper or braſs, when clipped into flat bits, each about two or three grains in weight, and about a quarter of a ſquare inch in ſurface, and when diſſolved in nitrous acid properly diluted, yield nitrous air very equably; but if iron be uſed, the pieces of it ſhould be larger and fewer; in ſhort, it ſhould preſent a much leſs ſurface to the diluted acid; otherwiſe the increaſe of heat in the proceſs, and the rapid production of elaſtic fluid, render the operation both difficult and dangerous for the operator.

190 Pure mercury yields the beſt.

As the nitrous air is moſtly neceſſary to try the goodneſs of reſpirable air, it is of great conſequence to make it always of one conſtant degree of goodneſs; but this object is anſwered by diſſolving ſubſtances of a very homologous nature in the nitrous acid; therefore it is plain, that the metals whoſe nature is more uniform muſt be preferred for this purpoſe. Accordingly, braſs yields nitrous air of a more uniform nature than iron: copper is ſuperior to braſs; but pure mercury is ſtill ſuperior to copper: and indeed this is the metal which, conſidering its nature, uniformity of ſubſtance, and eaſy ſolution, is upon the whole the moſt uſeful for this purpoſe.

It has been generally obſerved, that ſolid vegetable ſubſtances, when diſſolved in nitrous acid, yield more nitrous air than the animal ſubſtances, though this nitrous air is not ſo pure as that obtained from metals.

Sometimes it contains ſome fixed air, and a good deal of inflammable air, which is moſtly produced towards the end of the proceſs. On the other hand, the nitrous air extracted from animal-ſubſtances generally contains a good deal of phlogiſticated air, and ſometimes ſome fixed air. In order to obtain nitrous air from the ſolution of animal and vegetable ſubſtances in nitrous acid, often ſome degree of heat muſt be applied to the phial. The acid alſo ſometimes muſt be very concentrated, and in other caſes it muſt be diluted; but it is hardly worth while, or practicable, to determine with exactneſs all thoſe particular caſes.

To make Nitrous Air.—The metal, viz. copper, braſs, or mercury, is firſt put into the bottle (which as well as the whole proceſs, is the ſame as that deſcribed for *fixed Air*), ſo as to fill about one-third of the ſame; then ſome water is poured into the bottle, ſo as juſt to cover the metal filings; and laſtly, the nitrous acid is added, the quantity of which, when ſtrong, ſhould be about one-third or half the quantity of the water. The ſmell of the nitrous gas is very penetrating and offenſive, and occaſions a red ſmoak as ſoon as it comes into contact with the common air; hence, whenever any of it eſcapes from the bottle, it may be obſerved not only by the ſmell, but alſo by the ſlight red colour.

In order to obſerve the principal property of this elaſtic fluid, which is that of diminiſhing the bulk of common air, let a glaſs tube, cloſed at one end, and about nine inches long, and half or three quarters of an inch in diameter, be filled with water, and inverted in water; then take a ſmall phial, of about half an ounce-meaſure, filled with common air, and plunging it under the water contained in the ſame baſin where the inverted tube is kept, let that quantity of air enter into the tube, which will go to the top of it, the water ſubſiding accordingly. Let a mark be made, either with a file or by ſticking ſoft wax on the tube, juſt oppoſite to the ſurface of the water in it, which will mark how much of the tube is filled by that given meaſure of air. After the ſame manner, fill the ſame ſmall phial (which we ſhall call the *meaſure*) again with air; throw that air into the tube, and put a mark on the tube coinciding with the level of the water in it. In this manner let four or five meaſures be marked on the tube. Now, if three meaſures of common air are

put

Of Artificial Airs.

put into this tube, when filled with water and inverted they will fill a ſpace of it as far as the third mark. The ſame thing will happen if three meaſures of nitrous inſtead of common air be put in it; but if two meaſures of common air and one meaſure of nitrous air, or one meaſure of the former and two of the latter, be introduced in it, they will fill a ſpace much ſhorter than the third mark. On the moment that theſe two kinds of elaſtic fluids come into contact, a reddiſh appearance is perceived, which ſoon vaniſhes, and the water, which at firſt nearly reaches the third mark, riſes gradually into the tube, and becomes nearly ſtationary after about two or three minutes; which ſhows that the diminution is effected gradually. See Eudiometer.

§ 4. *To procure* Dephlogisticated *Air*.—This is no other than exceedingly pure atmoſpherical air, entirely free from thoſe heterogeneous vapours which contaminate the air we commonly breathe. The eaſieſt method of procuring this air is to put ſome red-lead into the bottle, together with ſome good ſtrong oil of vitriol, but without any water. Let the red-lead fill about a quarter of the bottle, and the vitriolic acid be about the ſame quantity or very little leſs; then apply the bent tube to the bottle and proceed in the ſame manner as above. But it muſt be remarked, that without heat this mixture of red-lead and vitriolic acid will not give any dephlogiſticated air, or it yields an inconſiderable quantity of it; for which reaſon the flame of a candle (that of a wax taper is ſufficient) muſt be applied under the bottom of the bottle; which for this purpoſe muſt be rather thin, otherwiſe it will be eaſily cracked (a). In this manner the red-lead will yield a good quantity of elaſtic fluid, the greateſt part of which is dephlogiſticated air; but not the whole quantity of it, for a good portion of fixed air comes out with it. In order to ſeparate the fixed air from the dephlogiſticated air, the inverted bottle, when filled with the compound of both, as it is emitted from the red-lead, muſt be ſhook in the baſin for impregnating water with fixed air; by which means the water will abſorb the whole quantity of fixed air, and leave the dephlogiſticated air by itſelf.

From every experiment it appears, that dephlogiſticated air, if it could readily be obtained, and at a cheap rate, would be a moſt valuable manufacture. The heat communicated by means of it to burning fuel is incredible.

Theſe are not the only advantages which might be expected from dephlogiſticated air. It has been found by experience, that animals will live much longer in this kind of air than in an equal quantity of common air; whence it is ſuppoſed, that the breathing of it muſt be much more healthy, and contribute to longevity much more than the common atmoſphere. Nay, there are not wanting ſome who attribute the longevity of the Antediluvians to the great purity of the atmoſphere at that time; the whole maſs being afterwards tainted by the deluge, in ſuch a manner that it could never regain its former purity and ſalubrity. But all this as yet is mere conjecture; and excepting the ſingle fact, that animals live much longer in a quantity of dephlogiſticated than of common air, there is no evidence that the former contributes more to longevity than the latter. Dr Prieſtley even throws out a conjecture, that the uſe of dephlogiſticated air might perhaps wear out the ſyſtem much ſooner than common air, in the ſame manner as it conſumes fuel much faſter than common air. The great quantity, however, even of the pureſt air, which is requiſite to ſupport animal life, and the expence and trouble of the moſt ready methods of procuring it, have hitherto prevented any fair trial from being made. Yet philoſophers, conſidering the probability there is of this kind of air being ſalutary in many diſeaſes, have beſtowed ſome pains in attempting to find out methods of procuring it eaſily and in large quantity; concerning which we have the following obſervations in Cavallo's Treatiſe on Air.

"A man makes in general about 15 inſpirations in a minute, and takes in about 30 cubic inches of aërial fluid. But the air which has been once inſpired is not thereby much injured, and it may be reſpired again and again; ſo that, upon a very moderate calculation, and as appears from actual experiments often repeated, we may ſafely aſſert, that a perſon can breathe 400 cubic inches of good ordinary atmoſpheric air, at leaſt 30 times, without any inconvenience, i. e. it would ſerve for two minutes; after which that air, though much depraved, is ſtill in a ſtate of being breathed, but then it would occaſion ſome uneaſineſs. Now, ſuppoſing the dephlogiſticated air employed to be four times more pure than common air, 400 cubic inches of dephlogiſticated air would ſerve for at leaſt 120 reſpirations, or eight minutes.

"But ſuppoſing that 30 inches of common air are completely phlogiſticated by a ſingle inſpiration, and changed for ſuch as is quite freſh, which indeed is the caſe in common reſpiration, then 450 cubic inches of common air will be requiſite for one minute's reſpiration, and 27,000 for one hour; and as dephlogiſticated air is ſuppoſed to be four times as good, the ſame quantity of it will ſerve for four hours. Indeed, if we could depend on the aſſertions of Mr Fontana, that by adding lime-water to abſorb the fixed air produced by reſpiration, an animal can live 30 times as long as without it, no doubt a much ſmaller quantity would ſerve."

But it is certain ſuch aſſertions cannot be true; becauſe, though the fixed air ſhould be abſorbed as ſoon as produced, the remaining quantity would ſtill be contaminated by phlogiſton. Nay, we are informed by Dr Prieſtley, who repeated Fontana's experiments,

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(a) In this operation the flame of the candle when once applied, muſt be kept continually near it; and when the mixture does not produce any more elaſtic fluid, or the operation is required to be intermitted, care ſhould be taken to remove the extremity of the bent tube from the water firſt, and then to take off the flame of the candle from under the bottle; otherwiſe, if the flame of the candle be firſt removed, the materials within the bottle condenſing by cold, the water immediately enters, which in an inſtant fills the bottle, and generally breaks it.

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that animals *will not* live longer in a quantity of dephlogiſticated air when it ſtands in contact with lime-water, than they will when no lime-water is uſed. In what manner a difference ſo enormous can take place, between philoſophers in other reſpects ſo accurate, we can by no means determine. It is plain, however, that if 27,000 inches of common air are neceſſary for a perſon in one hour, the ſame quantity of dephlogiſticated air cannot be breathed longer than four hours, nor even ſo long with any real advantage. Mr Cavallo indeed allows only 12000 inches for four hours; but though this might no doubt ſuſtain life for that time, the perſon muſt at beſt expect nothing from it ſuperior to the common atmoſphere, if he was not materially injured by it.

A very ready method of procuring dephlogiſticated air in large quantity, is by means of nitre; and on the ſuppoſition that 12,000 inches are ſufficient for four hours, (or for 40 hours, as he limits the Abbé Fontana's ſuppoſition), Mr Cavallo proceeds in the following manner; "The inſtruments neceſſary for the production of dephlogiſticated air from nitre are the following; viz. earthen retorts, or earthen veſſels with a ſtraight neck, ſomewhat in the ſhape of Florence flaſks, but with a longer neck, theſe being cheaper than the retorts, and anſwering as well;—a ſmall furnace, in which the earthen retort muſt be kept red-hot; a common chimney-fire is not ſufficient. Theſe furnaces may be very eaſily made out of large black lead crucibles. The nitre muſt be put into the retort or other veſſel, ſo as to fill half or nearly three quarters of its belly; then a bent glaſs tube is luted to the neck of the earthen veſſel, in ſuch a manner as not to let any elaſtic fluid eſcape into the open air. The beſt lute or cement for this or ſimilar purpoſes is made by mixing together whiting and drying oil. The retort being put into the furnace, muſt be ſurrounded with lighted charcoal, which is to be ſupplied according as it waſtes: in ſhort, the belly of the retort muſt be kept quite red-hot, or rather white-hot, for about three hours at leaſt. If, inſtead of the retort, the other deſcribed earthen veſſel be uſed, care ſhould be had to place it with the neck as little inclined to the horizon as poſſible, leſt the nitre ſhould ſtop the neck and break it." The air is then to be received into large glaſs jars, as is uſual in other experiments on air.

"The retort or other earthen veſſel that is uſed for this purpoſe cannot ſerve for more than once, becauſe it generally breaks in cooling; and beſides, the decompoſed nitre cannot be eaſily taken out of it. The retort capable of holding a pound of nitre (the quantity neceſſary for producing 12,000 cubic inches of dephlogiſticated air) for this operation, coſts at leaſt half-a-crown; the other earthen veſſels in the ſhape of Florence flaſks, but with longer necks, coſt about 18d. a-piece, or 2s.; ſo that the price of theſe veſſels forms a conſiderable part of the expence. If glaſs veſſels are employed, the nitre will not yield near ſo much air, though of a purer ſort, becauſe the glaſs veſſels cannot endure ſuch a great fire as the earthen ones. The retorts of metal, or at leaſt of thoſe metals which are moſt uſually employed for this purpoſe, viz. iron and copper, phlogiſticate in a great meaſure the air as ſoon as produced. Conſidering, then, all theſe circumſtances, it appears, that when a perſon has all the uſual apparatus and furnace, the expences at preſent neceſſary in London for the production of 12,000 cubic inches of dephlogiſticated air, (viz. the price of one pound of nitre, of an earthen retort or other veſſel, and of charcoal), amount to about 4s. or 4s. 6d.

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Another method of preparing dephlogiſticated air is, by blowing that of the common atmoſphere through melted nitre. In this proceſs the phlogiſton contained in the atmoſphere is gradually conſumed, by detonating with the acid of the nitre, and therefore iſſues much more pure than before. This method has the appearance at firſt of being much eaſier and more commodious than the former; but as it is impoſſible to mix the atmoſpheric air ſo exactly with the melted nitre that every particle of the one may come in contact with every particle of the other, it is plain that the former method muſt be preferable; not to mention that it will be found exceedingly troubleſome to blow the air thro' the nitre, as the latter will be perpetually apt to cool and concrete into lumps by the cold blaſt.

§ 5. *To procure* VITRIOLIC *Acid Air*.—This conſiſts of the vitriolic acid, united with ſome phlogiſton, which volatilizes and renders it capable of aſſuming the form of a permanently elaſtic fluid. To obtain it, ſome ſtrong concentrated vitriolic acid muſt be put into the uſual bottle, together with ſome ſubſtance capable of furniſhing phlogiſton. Olive oil anſwers very well. The oil of vitriol ſhould be about three or four times as much as the ſweet oil, and both together ſhould fill about one-third or half the bottle. A gentle degree of heat is then required, in order to let theſe materials yield any elaſtic fluid; which may be done by applying the flame of a wax taper, as directed above for the production of dephlogiſticated air.

§ 6. *To procure* MARINE *Acid Air*, which is no other than the marine acid itſelf, and which without any addition becomes a permanently elaſtic fluid; put ſome ſea-ſalt, or common kitchen-ſalt, into the uſual bottle in which the materials for producing elaſtic fluids are generally put, ſo as to fill about a fourth part of it, and upon this ſalt pour a ſmall quantity of good concentrated vitriolic acid: then apply the bent tube to the bottle, and introduce it through the quickſilver into the receiver, filled with and inverted in quickſilver after the uſual method, and the elaſtic fluid is copiouſly produced.

§ 7. *To procure* NITROUS *Acid Air*.—This may be obtained from heated nitrous acid, the vapour of which acquires a permanent elaſticity, and it has been found to remain uncondenſed into a viſible fluid by any cold to which it has been hitherto expoſed. The great difficulty is to find a fluid capable of confining this acid air; becauſe it is eaſily and abundantly abſorbed by water, which is one of its properties by which it differs from nitrous air. It acts upon quickſilver, and alſo upon oils: hence its examination cannot be made but very imperfectly; for ſubſtances muſt be expoſed to it, or mixed with it, whilſt it is actually changing its nature by acting on the mercury or other fluid that confines it.

When water has abſorbed a good quantity of this elaſtic fluid, it acquires the properties of nitrous acid; and when heated, it yields a large quantity of nitrous air,

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air, viz. a quantity many times greater than that which water is wont to imbibe of it by agitation, or by any known means.

When the nitrous acid air is combined with eſſential oils, a conſiderable effervеſcence and heat are produced, nearly in the ſame manner as when the nitrous acid itſelf is poured upon thoſe oils.

§ 8. *Fluor Acid Air*.—Put ſome of thoſe minerals called *fluors*, or *fuſible ſpars*, pulverized, into the uſual bottle, and upon it pour ſome concentrated oil of vitriol; then adapt the bent tube, &c. The fluor acid air is at firſt produced without the help of heat; but in a ſhort time it will be neceſſary to apply the flame of a candle to the bottle, by which means a conſiderable quantity of this elaſtic fluid is obtained.

§ 9. *Alkaline Air*.—Let the uſual bottle be about half filled with volatile ſpirit of ſal-ammoniac; and after applying the bent tube, &c. let the flame of a candle be brought under the bottle, by which means the alkaline air will be produced copiouſly.

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AEROMANCY, a ſpecies of divination performed by means of air, wind, &c. See DIVINATION, n° 5.

AEROMETRY, the ſcience of meaſuring the air. It comprehends not only the doctrine of the air itſelf, conſidered as a fluid body; but alſo its preſſure, elaſticity, rarefaction, and condenſation. But the term is at preſent not much in uſe, this branch of natural philoſophy being more frequently called Pneumatics. See PNEUMATICS.

AERONAUT, a perſon who attends and guides an air-balloon. See AEROSTATION and AIR-*Balloon*.

AERONAUTICA, from αηρ and ναυτικος, derived from ναυς, ſhip; the art of ſailing in a veſſel or machine through the atmoſphere, ſuſtained as a ſhip in the ſea. See AEROSTATION.

AEROPHYLACEA, a term uſed by naturaliſts for caverns or reſervoirs of air, ſuppoſed to exiſt in the bowels of the earth. Kircher ſpeaks much of aerophylacea, or huge caverns, replete with air, diſpoſed under ground; from whence, through numerous occult paſſages, that element is conveyed either to ſubterraneous receptacles of water, which, according to him, are hereby raiſed into ſprings or rivers, or into the funds of ſubterraneous fire, which are hereby fed and kept alive for the reparation of metals, minerals, and the like.

AEROSTATION

IS a ſcience newly introduced into the Encyclopædia. The word, in its primitive ſenſe, denotes the ſcience of ſuſpending weights in the air; but in its modern acceptation, it ſignifies *aerial navigation*, or the art of navigating through the atmoſphere. Hence alſo the machines which are employed for this purpoſe are called *aeroſtats*, or *aeroſtatic* machines; and from their globular ſhape, *air-balloons*.

1 Lord Bacon firſt publiſhed the true principles of aeroſtation.

2 Impoſſibility of flying by mechanical means

The romances of almoſt every nation have recorded inſtances of perſons being carried through the air, both by the agency of ſpirits and by mechanical inventions; but till the time of the celebrated Lord Bacon, no rational principle appears ever to have been thought of by which this might be accompliſhed. Before that time, indeed, Friar Bacon had written upon the ſubject; and many had been of opinion, that, by means of artificial wings, fixed to the arms or legs, a man might fly as well as a bird: but theſe opinions were thoroughly refuted by Borelli in his treatiſe *De Motu Animalium*, where, from a compariſon between the power of the muſcles which move the wings of a bird, and thoſe which move the arms of a man, he demonſtrates that the latter are utterly inſufficient to ſtrike the air with ſuch force as to raiſe him from the ground. It cannot be denied, however, that wings of this kind, if properly conſtructed, and dextrouſly managed, might be ſufficient to break the fall of a human body from an high place, ſo that ſome adventurers in this way might poſſibly come off with ſafety; though by far the greateſt number of thoſe who have raſhly adopted ſuch ſchemes, have either loſt their lives or limbs in the attempt.

3 Scheme of Biſhop Wilkins and Albertus de Saxonia.

In the year 1672, Biſhop Wilkins publiſhed a treatiſe, intitled, The Diſcovery of the New World; in which he mentions, though in a very indiſtinct and confuſed manner, the true principle on which the air is navigable; quoting, from Albertus de Saxonia and Francis Mendoca, "that the air is in ſome part of it navigable: and upon this ſtatic principle, any braſs or iron veſſel (ſuppoſe a kettle), whoſe ſubſtance is much heavier than that of water, yet being filled with the lighter air, it will ſwim upon it and not ſink. So ſuppoſe a cup or wooden veſſel upon the outward borders of this elementary air, the capacity of it being filled with fire, or rather ethereal air, it muſt neceſſarily, upon the ſame ground, remain ſwimming there, and of itſelf can no more fall than an empty ſhip can ſink." This idea, however, he did not by any means purſue, but reſted his hopes entirely upon mechanical motions, to be accompliſhed by the mere ſtrength of a man, or by ſprings, &c. and which have been demonſtrated incapable of anſwering any uſeful purpoſe.

4 Biſhop Lana's ſcheme

The only perſon who brought his ſcheme of flying to any kind of rational principle was the Jeſuit Francis Lana, cotemporary with Biſhop Wilkins. He, being acquainted with the real weight of the atmoſphere, juſtly concluded, that if a globular veſſel were exhauſted of air, it would weigh leſs than before; and conſidering that the ſolid contents of veſſels increaſe in much greater proportion than their ſurfaces; he ſuppoſed that a metalline veſſel might be made ſo large, that, when emptied of its air, it would be able not only to raiſe itſelf in the atmoſphere, but to carry up paſſengers along with it; and he made a number of calculations neceſſary for putting the project in execution. But though the theory was here unexceptionable, the means propoſed were certainly inſufficient to accompliſh the end; for a veſſel of copper, made ſo thin as was neceſſary to make it float in the atmoſphere, would be utterly unable to reſiſt the external preſſure; which being demonſtrated by thoſe ſkilled in mechanics, no attempt was made on that principle.

5 Strange propoſal of Friar Guſman.

In the year 1709, however, as we are informed by a letter publiſhed in France in 1784, a Portugueſe projector, Friar Guſman, applied to the king for encouragement to his invention of a flying machine. The principle on which this was conſtructed, if indeed it had any principle, ſeems to have been that of the paper kite. The machine was conſtructed in form of a bird, and contained ſeveral tubes through which the wind was to paſs, in order to fill a kind of ſails, which were to elevate it; and when the wind was deficient, the ſame effect was to be performed by means of bellows concealed within the body of the machine. The aſcent was alſo to be promoted by the electric attraction of pieces of amber placed in the top, and by two ſpheres incloſing magnets in the ſame ſituation.

Theſe childiſh inventions ſhow the low ſtate of ſcience at that time in Portugal, eſpecially as the king, in order to encourage him to farther exertions in ſuch an uſeful invention, granted him the firſt vacant place in his college of Barcelos or Santarem, with the firſt profeſſorſhip in the Univerſity of Coimbra, and an annual penſion of 600,000 reis during his life. Of this De Guſman, it is alſo related, that in the year 1736, he made a wicker baſket of about ſeven or eight feet diameter, and covered with paper, which raiſed itſelf about 200 feet in the air, and the effect was generally attributed to witchcraft.

6 Poſſibility of bodies riſing in the air thought of by Dr Black and Mr Cavallo.

In the year 1766, Mr Henry Cavendiſh aſcertained the weight and other properties of inflammable air, determining it to be at leaſt ſeven times lighter than common air. Soon after which, it occurred to Dr Black, that perhaps a thin bag filled with inflammable air might be buoyed up by the common atmoſphere; and he thought of having the allantois of a calf prepared for this purpoſe: but his other avocations prevented him from proſecuting the experiment. The ſame thought occurred ſome years afterwards to Mr Cavallo; and he has the honour of being the firſt who made experiments on the ſubject. He firſt tried bladders; but the thinneſt of theſe, however well ſcraped and prepared, were found too heavy. He then tried Chineſe paper; but that proved ſo permeable, that the vapour paſſed through it like water through a ſieve. His experiments, therefore, made in the year 1782, proceeded ed no farther than blowing up ſoap-bubbles with inflammable air, which aſcended rapidly to the ceiling, and broke againſt it.

7
Aeroſtation diſcovered by Monſ. Montgolfier.

But while the diſcovery of the art of aeroſtation ſeemed thus on the point of being made in Britain, it was all at once announced in France, and that from a quarter whence nothing of the kind was to have been expected. Two brothers, Stephen and John Montgolfier, natives of Annonay, and maſters of a conſiderable paper-manufactory there, had turned their thoughts towards this project as early as the middle of the year 1782. The idea was firſt ſuggeſted by the natural aſcent of the ſmoke and clouds in the atmoſphere; and their deſign was to form an artificial cloud, by incloſing the ſmoke in a bag, and making it carry up the covering along with it. Towards the middle of November that year, the experiment was made at Avignon with a fine ſilk bag of a parallelopiped ſhape. By applying burning paper to the lower aperture, the air was rarefied, and the bag aſcended in the atmoſphere, and ſtruck rapidly againſt the ceiling. On repeating the experiment in the open air, it roſe to the height of about 70 feet.

8
Account of his experiments.

An experiment on a more enlarged ſcale was now projected; and a new machine, containing about 650 cubic feet, was made, which broke the cords that confined it, and roſe to the height of about 600 feet. Another of 35 feet in diameter roſe about 1000 feet high, and fell to the ground three quarters of a mile from the place where it aſcended. A public exhibition was next made on the 5th of June 1783, at Annonay, where a vaſt number of ſpectators aſſembled. An immenſe bag of linen, lined with paper, and containing upwards of 23,000 cubic feet, was found to have a power of lifting about 500 pounds, including its own weight. The operation was begun by burning chopped ſtraw and wool under the aperture of the machine, which immediately began to ſwell; and after being ſet at liberty, aſcended into the atmoſphere. In ten minutes it had aſcended 6000 feet; and when its force was exhauſted, it fell to the ground at the diſtance of 7668 feet from the place from whence it ſet out.

Soon after this, one of the brothers arrived at Paris, where he was invited by the Academy of Sciences to repeat his experiments at their expence. In conſequence of this invitation, he conſtructed, in a garden in the Fauxbourg of St Germain, a large balloon of an elliptical form. In a preliminary experiment, this machine lifted up from the ground eight perſons who held it, and would have carried them all off if more had not quickly come to their aſſiſtance. Next day the experiment was repeated in preſence of the members of the academy; the machine was filled by the combuſtion of 50 pounds of ſtraw made up in ſmall bundles, upon which about 12 pounds of chopped wool were thrown at intervals. The uſual ſucceſs attended this exhibition: The machine ſoon ſwelled; endeavoured to aſcend; and immediately after ſuſtained itſelf in the air, together with the charge of between 4 and 500 pounds weight. It was evident that it would have aſcended to a greater height; but as it was deſigned to repeat the experiment before the king and royal family at Verſailles, the cords by which it was tied down were not cut. But in conſequence of a violent rain and wind which happened at this time, the machine was ſo far damaged, that it became neceſſary to prepare a new one for the time that it had been determined to honour the experiment with the royal preſence; and ſuch expedition was uſed, that this vaſt machine, of near 60 feet in height and 43 in diameter, was made, painted with water-colours both within and without, and finely decorated, in no more than four days and four nights. Along with this machine was ſent a wicker cage, containing a ſheep, a cock, and a duck, which were the firſt animals ever ſent through the atmoſphere. The full ſucceſs of the experiment was prevented by a violent guſt of wind which tore the cloth in two places near the top before it aſcended: However, it roſe to the height of 1440 feet; and, after remaining in the air about eight minutes, fell to the ground at the diſtance of 10,200 feet from the place of its ſetting out. The animals were not in the leaſt hurt.

9
Some animals ſafely ſent thro' the air.

10
Mr Pilatre de Rozier the firſt aerial navigator.

The great power of theſe aeroſtatic machines, and their very gradual deſcent in falling to the ground, had originally ſhowed that they were capable of tranſporting people through the air with all imaginable ſafety; and this was further confirmed by the experiment already mentioned. As Mr Montgolfier, therefore, propoſed to make a new aeroſtatic machine of a firmer and better conſtruction than the former, Mr Pilatre de Rozier offered himſelf to be the firſt aerial adventurer.

This new machine was conſtructed in a garden in the Fauxbourg of St Antoine. It was of an oval ſhape, about 48 feet in diameter and 74 in height; elegantly painted on the outſide with the ſigns of the zodiac, cyphers of the king's name, and other ornaments. A proper gallery, grate, &c. were appended in the manner afterwards deſcribed; ſo that it was eaſy for the perſon who aſcended to ſupply the fire with fuel, and thus keep up the machine as long as he pleaſed. The weight of the whole apparatus was upwards of 1600 pounds. The experiment was performed on the 15th of October 1783. Mr Pilatre having placed himſelf in the gallery, the machine was inflated, and permitted to aſcend to the height of 84 feet, where he kept it afloat for about four minutes and a half; after which it deſcended very gently; and ſuch was its tendency to aſcend, that it rebounded to a conſiderable height after touching the ground. Two days after, he repeated the experiment with the ſame ſucceſs as before; but the wind being ſtrong, the machine did not ſuſtain itſelf ſo well as formerly. On repeating the experiment in calmer weather, he aſcended to the height of 210 feet. His next aſcent was 262 feet; and in the deſcent, a guſt of wind having blown the machine over ſome large trees of an adjoining garden, Mr Pilatre ſuddenly extricated himſelf from ſo dangerous a ſituation, by throwing ſome ſtraw and chopped wool on the fire, which raiſed him at once to a ſufficient height. On deſcending again, he once more raiſed himſelf to a proper height by throwing ſtraw on the fire. Some time after, he aſcended in company with Mr Girond de Villette to the height of 330 feet; hovering over Paris at leaſt nine minutes in ſight of all the inhabitants, and the machine keeping all the while perfectly ſteady.

11
Account of his different voyages.

Theſe experiments had ſhown, that the aeroſtatic machines might be raiſed or lowered at the pleaſure of the perſons who aſcended; they had likewiſe diſcovered, that the keeping them faſt with ropes was no advantage; but, on the contrary, that this was attended with inconvenience and hazard. On the 21ſt of November 1783, therefore, Mr Pilatre determined to undertake an aerial voyage in which the machine ſhould be fully ſet at liberty. Every thing being got in readineſs, the balloon was filled in a few minutes; and Mr Pilatre placed himſelf in the gallery, counterpoiſed by the Marquis d'Arlandes, who occupied the other ſide. It was intended to make ſome preliminary experiments on the aſcending power of the machine: but the violence of the wind prevented this from being done, and even damaged the balloon eſſentially; ſo that it would have been entirely deſtroyed had not timely aſſiſtance been given. The extraordinary exertions of the workmen, however, repaired it again in two hours, and the adventurers ſet out. They met with no inconvenience during their voyage, which laſted about 25 minutes; during which time they had paſſed over a ſpace of above five miles.—From the account given by the Marquis d'Arlandes, it appears that they met with ſeveral different currents of air; the effect of which was, to give a very ſenſible ſhock to the machine, and the direction of the motion ſeemed to be from the upper part downwards. It appears alſo that they were in ſome danger of having the balloon burnt altogether; as the Marquis obſerved ſeveral round holes made by the fire in the lower part of it, which alarmed him conſiderably, and indeed not without reaſon. However, the progreſs of the fire was eaſily ſtopped by the application of a wet ſponge, and all appearance of danger ceaſed in a very ſhort time.

12
Montgolfier's machines ſuperſeded by thoſe filled with inflammable air.

13
Experiment of Meſſrs Charles & Roberts.

This voyage of M. Pilatre and the Marquis d'Arlandes may be ſaid to conclude the hiſtory of thoſe aeroſtatic machines which are elevated by means of fire; for though many other attempts have been made upon the ſame principle, moſt of them have either proved unſucceſsful or were of little conſequence. They have therefore given place to the other kind, filled with inflammable air; which, by reaſon of its ſmaller ſpecific gravity, is both more manageable, and capable of performing voyages of greater length, as it does not require to be ſupplied with fuel like the others. This was invented a very ſhort time after the diſcovery had been made by M. Montgolfier. This gentleman had indeed deſigned to keep his method in ſome degree a ſecret from the world; but as it could not be concealed, that a bag filled with any kind of fluid lighter than the common atmoſphere would riſe in it, inflammable air was naturally thought of as a proper ſuccedaneum for the rarefied air of M. Montgolfier. The firſt experiment was made by two brothers Meſſrs Roberts, and M. Charles a profeſſor of experimental philoſophy. The bag which contained the gas was compoſed of luteſtring, varniſhed over with a ſolution of the elaſtic gum called *caoutchouc*; and that with which they made their firſt eſſay was only about 13 Engliſh feet in diameter. Many difficulties occurred in filling it with the inflammable air, chiefly owing to their ignorance of the proper apparatus; inſomuch, that, after a whole day's labour from nine in the morning, they had got the balloon only one third part full. Next morning they were ſurpriſed to find that it had fully inflated of itſelf during the night: but upon inquiry, it was found, that they had inadvertently left open a ſtop-cock connected with the balloon, by which the common air gaining acceſs, had mixed itſelf with the inflammable air; forming a compound ſtill lighter than the common atmoſphere, but not ſufficiently light to anſwer the purpoſes of aeroſtation. Thus they were obliged to renew their operation; and, by ſix o'clock in the evening of next day, they found the machine conſiderably lighter than the common air; and, in an hour after, it made a conſiderable effort to aſcend. The public exhibition, however, had been announced only for the third day after; ſo that the balloon was allowed to remain in an inflated ſtate for a whole day; during which they found it had loſt a power of aſcent equal to about three pounds, being one ſeventh part of the whole. When it was at laſt ſet at liberty, after having been well filled with inflammable air, it was 35 pounds lighter than an equal bulk of common air. It remained in the atmoſphere only three quarters of an hour, during which it had traverſed 15 miles. Its ſudden deſcent was ſuppoſed to have been owing to a rupture which had taken place when it aſcended into the higher regions of the atmoſphere.

14
In what manner a balloon partly filled may inflate itſelf.

15
Loſs of power in their balloon.

16
Firſt aerial voyage of Meſſrs Charles & Roberts.

The ſucceſs of this experiment, and the aerial voyage made by Meſſrs Rozier and Arlandes, naturally ſuggeſted the idea of undertaking ſomething of the ſame kind with a balloon filled with inflammable air. The machine uſed on this occaſion was formed of gores of ſilk, covered over with a varniſh made of *caoutchouc*, of a ſpherical figure, and meaſuring 27½ feet in diameter. A net was ſpread over the upper hemiſphere, and was faſtened to an hoop which paſſed round the middle of the balloon. To this a ſort of car, or rather boat, was ſuſpended by ropes, in ſuch a manner as to hang a few feet below the lower part of the balloon; and, in order to prevent the burſting of the machine, a valve was placed in it; by opening of which ſome of the inflammable air might be occaſionally let out. A long ſilken pipe communicated with the balloon, by means of which it was filled. The boat was made of baſket-work, covered with painted linen, and beautifully ornamented; being 8 feet long, 4 broad, and 3½ deep; its weight 130 pounds. At this time, however, as at the former, they met with great difficulties in filling the machine with inflammable air, owing to their ignorance of the moſt proper apparatus. But at laſt, all obſtacles being removed, the two adventurers took their ſeats at three quarters after one in the afternoon of the firſt of December 1783. Perſons ſkilled in mathematics were conveniently ſtationed with proper inſtruments to calculate the height, velocity, &c. of the balloon. The weight of the whole apparatus, including that of the two adventurers, was found to be 604½ pounds, and the power of aſcent when they ſet out was 20 pounds; ſo that the whole difference betwixt the weight of this balloon and an equal bulk of common air was 624 pounds. But the weight of common atmoſphere diſplaced by the inflammable gas was calculated to be 771 pounds, ſo that there remains 147 for the weight of the latter; and this calculation makes it only 5¼ times lighter than common air.

17
Specific gravity of the inflammable air in this firſt voyage.

At the time the balloon left the ground, the thermometer ſtood at 9° of Fahrenheit's ſcale, and the quickſilver in the barometer at 30.18 inches; and, by means of the power of aſcent with which they left the ground, the balloon roſe till the mercury fell to 27 inches, from which they calculated their height to be about 600 yards. By throwing out ballaſt occaſionally as they found the machine deſcending by the eſcape of ſome of the inflammable air, they found it practicable to keep at pretty near the ſame diſtance from the earth during the reſt of their voyage; the quickſilver fluctuating between 27 and 27.65 inches, and the thermometer between 53° and 57°, the whole time. They continued in the air for the ſpace of an hour and three quarters, when they alighted at the diſtance of 27 miles from Paris; having ſuffered no inconvenience during their voyage, nor experienced any contrary currents of air, as had been felt by Meſſrs Pilatre and Arlandes.

18
Mr Charles aſcends by himſelf.

As the balloon ſtill retained a great quantity of inflammable gas, Mr Charles determined to take another voyage by himſelf. Mr Robert accordingly got out of the boat, which was thus lightened by 130 pounds, and of conſequence the aeroſtatic machine now had nearly as much power of aſcent. Thus he was carried up with ſuch velocity, that in twenty minutes he was almoſt 9000 feet high, and entirely out of ſight of terreſtrial objects. At the moment of his parting with the ground, the globe had been rather flaccid; but it ſoon began to ſwell, and the inflammable air eſcaped from it in great quantity through the ſilken tube. He alſo frequently drew the valve that it might be the more freely emitted, and the balloon effectually prevented from burſting. The inflammable gas being conſiderably warmer than the external air, diffuſed itſelf all round, and was felt like a warm atmoſphere; but in ten minutes the thermometer indicated a variation of temperature as great as that between the warmth of ſpring and the ordinary cold of winter.

19
Has a pain in his ear and jaw when in the higher regions.

His fingers were benumbed by the cold, and he felt a violent pain in his right ear and jaw, which he aſcribed to the dilatation of the air in theſe organs as well as to the external cold. The beauty of the proſpect which he now enjoyed, however, made amends for theſe inconveniences. At his departure the ſun was ſet on the valleys; but the height to which Mr Charles was got in the atmoſphere, rendered him again viſible, tho' only for a ſhort time. He ſaw, for a few ſeconds, vapours riſing from the valleys and rivers. The clouds ſeemed to aſcend from the earth, and collect one upon the other, ſtill preſerving their uſual form; only their colour was grey and monotonous for want of ſufficient light in the atmoſphere.

20
Various currents of wind and eddies in theſe regions.

By the light of the moon, he perceived that the machine was turning round with him in the air; and he obſerved that there were contrary currents which brought him back again.

21
Streamers of his banners ſtand upwards.

He obſerved alſo, with ſurpriſe, the effects of the wind, and that the ſtreamers of his banners pointed upwards; which, he ſays, could not be the effect either of his aſcent or deſcent, as he was moving horizontally at the time. At laſt, recollecting his promiſe of returning to his friends in half an hour, he pulled the valve, and accelerated his deſcent. When within 200 feet of the earth, he threw out two or three pounds of ballaſt, which rendered the balloon again ſtationary: but, in a little time afterwards, he gently alighted in a field about three miles diſtant from the place whence he ſet out; though, by making allowance for all the turnings and windings of the voyage, he ſuppoſes that he had gone through nine miles at leaſt. By the calculations of M. de Maunier, he roſe at this time not leſs than 10.500 feet high; a height ſomewhat greater than that of Mount Ætna. A ſmall balloon, which had been ſent off before the two brothers ſet out on their voyage, took a direction oppoſite to that of the large one, having met with an oppoſite current of air, probably at a much greater height.

The ſubſequent aerial voyages differ ſo little from that juſt now related, that any particular deſcription of them ſeems to be ſuperfluous.

22
Attempts to guide aeroſtatic machines in the atmoſphere.

It had occurred to Mr Charles, however, in his laſt flight, that there might be a poſſibility of directing the machine in the atmoſphere; and this was ſoon attempted by Mr Jean-Pierre Blanchard, a gentleman who had, for ſeveral years before, amuſed himſelf with endeavours to fly by mechanical means, though he had never ſucceeded in the undertaking. As ſoon as the diſcovery of the aeroſtatic machines was announced, however, he reſolved to add the wings of his former machine to a balloon, and made no doubt that it would then be in his power to direct himſelf through the air at pleaſure.

23
Two firſt voyages of Mr Blanchard.

In his firſt attempt he was fruſtrated by the impetuoſity of a young gentleman, who inſiſted, right or wrong, on aſcending along with him. In the ſcuffle which enſued on this occaſion, the wings and other apparatus were entirely deſtroyed; ſo that Mr Blanchard was obliged to commit himſelf to the direction of the wind; and in another attempt it was found, that all the ſtrength he could apply to the wings was ſcarce ſufficient to counteract the impreſſion of the wind in any degree. In his voyage, he found his balloon, at a certain period, acted upon by two contrary winds; but, on throwing out four pounds of ballaſt, he aſcended to a place where he met with the ſame current he had at ſetting out from the earth.

24
His ſenſations while in the atmoſphere.

His account of the ſenſations he felt during this voyage, was ſomewhat different from that of Mr Charles; having, in one part of it, found the atmoſphere very warm, in another cold; and having once found himſelf very hungry, and at another time almoſt overcome by a propenſity to ſleep. The height to which he roſe, as meaſured by ſeveral obſervations with mathematical inſtruments, was thought to be very little leſs than 20,000 feet; and he remained in the atmoſphere an hour and a quarter.

25
Voyage of Meſſ. Morveau and Bertrand.

The attempts of Mr Blanchard to direct his machine through the atmoſphere, were repeated in the month of April 1784 by Meſſrs Morveau and Bertrand, at Dijon, who raiſed themſelves with an inflammable air-balloon to the height, as it was thought, of 13,000 feet; paſſing through a ſpace of 18 miles in an hour and 25 minutes. Mr Morveau had prepared a kind of oars for directing the machine through the air; but they were damaged by a guſt of wind, ſo that only two of them remained ſerviceable; by working theſe, however, they were able to produce a ſenſible effect on the motion of the machine.

26
Third voyage of Mr Blanchard.

In a third aerial voyage performed by Mr Blanchard, he ſeemed to produce ſome effect by the agitation of his wings, both in aſcending, deſcending, moving ſidewiſe, and even in ſome meaſure againſt the wind; however, this is ſuppoſed, with ſome probability, to have been a miſtake, as, in all his ſucceeding voyages, the effects of his machinery could not be perceived.

27
Second voyage of Meſſrs. Charles & Robert.

The ſucceſs of Meſſrs Charles and Robert in their former experiments encouraged them ſoon to repeat them, with the addition of ſome machinery to direct their courſe. Having enlarged their former balloon to the ſize of an oblong ſpheroid 46⅓ feet long and 27½ in diameter, they made it to float with its longeſt part parallel to the horizon. The wings were made in the ſhape of an umbrella without the handle, to the top of which a ſtick was faſtened parallel to the aperture of the umbrella. Five of theſe were diſpoſed round the boat, which was near 17 feet in length. The balloon was filled in three hours, and, with the addition of 450 pounds of ballaſt, remained *in æquilibrio* with the atmoſphere. About noon, on the 19th of September 1784, they began to aſcend very gently in conſequence of throwing out 24 pounds of ballaſt, but were ſoon obliged to throw out eight pounds more in order to avoid running againſt ſome trees. Thus they roſe to the height of 1400 feet, when they perceived ſome thunder clouds near the horizon. On this they aſcended and deſcended, to avoid the danger, as the wind blew directly towards the threatening clouds; but, from the height of 600 feet to that of 4200 above the ſurface of the earth, the current was quite uniform and in one direction. During their voyage they loſt one of their oars; but found, that by means of thoſe which remained, they conſiderably accelerated their courſe. From the account of their voyage, it would ſeem that they had paſſed ſafely through the thunder-clouds; as we are informed, that, about 40 minutes after three, they heard a loud clap of thunder; and, three minutes after, another much louder; at which time the thermometer ſunk from 77 to 59 degrees. This ſudden cold, occaſioned by the approach of the clouds, condenſed the inflammable air ſo that the balloon deſcended very low, and they were obliged to throw out 40 pounds of ballaſt; yet on examining the heat of the air within the balloon, they found it to be 104°, when that of the external atmoſphere was only 63. When they had got ſo high that the mercury in the barometer ſtood only at 23.94 inches, they found themſelves becalmed; ſo that the machine did not go even at the rate of two feet in a ſecond, though it had before gone at the rate of 24 feet in a ſecond. On this they determined to try the effect of their oars to the utmoſt; and, by working them for 35 minutes, and marking the ſhadow of the balloon on the ground, they found, in that time, that they had deſcribed the ſegment of an ellipſis whoſe longeſt diameter was 6000 feet. After having travelled about 150 miles, they deſcended, only on account of the approach of night, having ſtill 200 pounds of ballaſt left.

28
Are in danger of running into thunder clouds.

29
Heat of the air within their balloon.

30
Effect of their oars in moving the machine.

Their concluſion, with regard to the effect of their wings, is as follows: "Thoſe experiments ſhow, that far from going againſt the wind, as is ſaid by ſome perſons to be poſſible in a certain manner, and ſome aeronauts pretend to have actually done, we only obtained, by means of two oars, a deviation of 22 degrees: it is certain, however, that if we could have uſed our four oars, we might have deviated about 40 degrees from the direction of the wind, and as our machine would have been capable of carrying ſeven perſons, it would have been eaſy for five perſons to have gone, and to have put in action eight oars, by means of which a deviation of about 80 degrees would have been obtained.

"We had already obſerved (ſay they), that if we did not deviate more than 22 degrees, it was becauſe the wind carried us at the rate of 24 miles an hour; and it is natural to judge, that, if the wind had been twice as ſtrong as it was, we ſhould not have deviated more than one-half of what we actually did; and, on the contrary, if the wind had been only half as ſtrong, our deviation would have been proportionably greater."

31
Contrivances uſed to prevent the waſte of inflammable air.

Having thus related all that has been done with regard to the conducting of aeroſtatic machines through the atmoſphere, we ſhall now relate the attempts that have been made to leſſen their expence, by falling upon ſome contrivance to aſcend without throwing out ballaſt, and to deſcend without loſing any of the inflammable air. The firſt attempt of this kind was made by the Duke de Chartres; who, on the 15th of July 1784, aſcended with the two brothers, Charles and Robert, from the park of St Cloud. The balloon was of an oblong form, made to aſcend with its longeſt diameter horizontally, and meaſured 55 feet in length and 24 in breadth. It contained within it a ſmaller balloon filled with common air; by blowing into which with a pair of bellows, and thus throwing in a conſiderable quantity of common air, it was ſuppoſed that the machine would become ſufficiently heavy to deſcend, eſpecially as, by the inflation of the internal bag, the inflammable air in the external one would be condenſed into a ſmaller ſpace, and thus become ſpecifically heavier. The voyage, however, was attended with ſuch circumſtances as rendered it impoſſible to know what would have been the event of the ſcheme. The power of aſcent with which they ſet out, ſeems to have been very great; as, in three minutes after parting with the ground, they were loſt in the clouds, and involved in ſuch a denſe vapour that they could ſee neither the ſky nor the earth. In this ſituation they ſeemed to be attacked by a whirlwind, which, beſides turning the balloon three times round from right to left, ſhocked, and beat it ſo about, that they were rendered incapable of uſing any of the means propoſed for directing their courſe, and the ſilk ſtuff of which the helm had been compoſed was even torn away. No ſcene can be conceived more terrible than that in which they were now involved. An immenſe ocean of ſhapeleſs clouds rolled one upon another below them, and ſeemed to prevent any return to the earth, which ſtill continued inviſible, while the agitation of the balloon became greater every moment. In this extremity they cut the cords which held the interior balloon, and of conſequence it fell down upon the aperture of the tube that came from the large balloon into the boat, and ſtopped it up. They were then driven upwards by a guſt of wind from below, which carried them to the top of the ſtormy vapour in which they had been involved. They now ſaw the ſun without a cloud; but the heat of his rays, with the diminiſhed denſity of the atmoſphere, had ſuch an effect on the inflammable air, that the balloon ſeemed every moment ready to burſt. To prevent this they introduced a ſtick through the tube, in order to puſh away the inner balloon from its aperture; but the expanſion of the inflammable air puſhed it ſo cloſe, that

32
Voyage of the Duke de Chartres.

33
Is involved in dark clouds and attacked by a whirlwind.

all attempts of this kind proved ineffectual. It was now, however, become abſolutely neceſſary to give vent to a very conſiderable quantity of the inflammable air; for which purpoſe the Duke de Chartres himſelf bored two holes in the balloon, which tore open for the length of ſeven or eight feet. On this they deſcended with great rapidity; and would have fallen into a lake, had they not haſtily thrown out 60 pounds of ballaſt, which enabled them juſt to reach the water's edge.

34 Unfortunate voyage and death of Meſſrs Rozier and Romaine.

The ſucceſs of the ſcheme for raiſing or lowering aeroſtatic machines by means of bags filled with common air being thus rendered dubious, another method was thought of. This was to put a ſmall aeroſtatic machine with rarefied air under an inflammable air-balloon, but at ſuch a diſtance that the inflammable air of the latter might be perfectly out of the reach of the fire uſed for inflating the former; and thus, by increaſing or diminiſhing the fire in the ſmall machine, the abſolute weight of the whole would be conſiderably diminiſhed or augmented. This ſcheme was unhappily put in execution by the celebrated Mr Pilatre de Rozier, and another gentleman named Mr Romaine. Their inflammable air balloon was about 37 feet in diameter, and the power of the rarefied-air one was equivalent to about 60 pounds. They aſcended without any appearance of danger or ſiniſter accident; but had not been long in the atmoſphere when the inflammable-air balloon was ſeen to ſwell very conſiderably, at the ſame time that the aeronauts were obſerved, by means of teleſcopes, very anxious to get down, and buſied in pulling the valve and opening the appendages to the balloon, in order to facilitate the eſcape of as much inflammable air as poſſible. A ſhort time after this the whole machine was on fire, when they had then attained the height of about three quarters of a mile from the ground. No exploſion was heard; and the ſilk which compoſed the air-balloon continued expanded, and ſeemed to reſiſt the atmoſphere for about a minute; after which it collapſed, and the remains of the apparatus deſcended along with the two unfortunate travellers ſo rapidly, that both of them were killed. Mr Pilatre ſeemed to have been dead before he came to the ground; but Mr Romaine was alive when ſome perſons came up to the place where he lay, though he expired immediately after.

35 Voyage of Meſſ. Blanchard and Jeffries acroſs the Straits of Dover.

Theſe are the moſt remarkable attempts that have been made to improve the ſcience of aeroſtation; tho' a great number of other expeditions through the atmoſphere have taken place. But of all the voyages which had been hitherto projected or put in execution, the moſt daring was that of Mr Blanchard and Dr Jeffries acroſs the ſtraits of Dover, which ſeparate Britain from France. This took place on the 7th of January 1785, being a clear froſty morning, with a wind, barely perceptible, at N.N.W. The operation of filling the balloon began at 10 o'clock, and, at three quarters after twelve, every thing was ready for their departure. At one o'clock Mr Blanchard deſired the boat to be puſhed off, which now ſtood only two feet diſtant from that precipice ſo finely deſcribed by Shakeſpeare in his tragedy of King Lear. As the balloon was ſcarcely ſufficient to carry two, they were obliged to throw out all their ballaſt except three bags of 10 pounds each; when they at laſt roſe gently, though making very little way on account of there being ſo little wind. At a quarter after one o-clock, the barometer, which on the cliff ſtood at 29.7 inches, was now fallen to 27.3, and the weather proved fine and warm. They had now a moſt beautiful proſpect of the ſouth coaſt of England, and were able to count 37 villages upon it. After paſſing over ſeveral veſſels, they found that the balloon, at 50 minutes after one, was deſcending, on which they threw out a ſack and an half of ballaſt; but as they ſaw that it ſtill deſcended, and that with much greater velocity than before, they now threw out all the ballaſt. This ſtill proving ineffectual, they next threw out a parcel of books they carried along with them, which made the balloon aſcend, when they were about midway betwixt France and England. At a quarter paſt two, finding themſelves again deſcending, they threw away the remainder of their books, and, ten minutes after, they had a moſt enchanting proſpect of the French coaſt. Still, however, the machine deſcended; and as they had now no more ballaſt, they were fain to throw away their proviſions for eating, the wings of the boat, and every other moveable they could eaſily ſpare. "We threw away, ſays Dr Jeffries, our only bottle, which, in its deſcent, caſt out a ſteam like ſmoke, with a ruſhing noiſe; and when it ſtruck the water, we heard and felt the ſhock very perceptibly on our car and balloon." All this proving inſufficient to ſtop the deſcent of the balloon, they next threw out their anchors and cords, and at laſt ſtripped of their clothes, faſtening themſelves to certain ſlings, and intending to cut away the boat as their laſt reſource. They had now the ſatisfaction, however, to find that they were riſing; and as they paſſed over the high lands between Cape Blanc and Calais, the machine roſe very faſt, and carried them to a greater height than they had been at any former part of their voyage. They deſcended ſafely among ſome trees in the foreſt of Guiennes, where there was juſt opening enough to admit them.

It would be tedious as well as unneceſſary to recount all the other aerial voyages that have been performed in different parts of Europe: It appeared ſufficient for the purpoſe of this article to notice thoſe which were moſt remarkable and intereſting; and therefore an account of the ingenious Mr Baldwin's excurſion from Cheſter, alluded to above, ſhall now cloſe our enumeration.

On the 8th of September 1785, at forty minutes paſt one P. M. Mr Baldwin aſcended from Cheſter in Mr Lunardi's (A) balloon. After traverſing in a variety of different directions, he firſt alighted, at 28 minutes after three, about twelve miles from Cheſter, in the neighbourhood of Frodſham; then reaſcending and purſuing his excurſion, he finally landed at Rixton moſs, five miles N.N.E of Wavington, and 25 miles from Cheſter. Mr Baldwin has publiſhed his Obſervations and Remarks made during his voyage, and taken from minutes. Our limits will not admit of relating many

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(A) Accounts of this gentleman's adventurous excurſions have been publiſhed in all the Newſpapers; and therefore it appeared unneceſſary to take up room with an account of them in this article.

many of his obſervations; but the few following are ſome of the moſt important and curious. “The ſenſation of aſcending is compared to that of a ſtrong preſſure from the bottom of the car upwards againſt the ſoles of his feet. At the diſtance of what appeared to him ſeven miles from the earth, though by the barometer ſcarcely a mile and a half, he had a grand and moſt enchanting view of the city of Cheſter and its adjacent places below. The river Dee appeared of a red colour; the city very diminutive; and the town entirely blue. The whole appeared a perfect plain, the higheſt building having no apparent height, but reduced all to the ſame level, and the whole terreſtrial proſpect appeared like a coloured map. Juſt after his firſt aſcent, being in a well-watered and maritime part of the country, he obſerved a remarkable and regular tendency of the balloon towards the ſea; but ſhortly after riſing into another current of air, he eſcaped the danger: this upper current, he ſays, was viſible to him at the time of his aſcent, by a lofty ſound ſtratum of clouds flying in a ſafe direction. The perſpective appearance of things to him was very remarkable. The loweſt bed of vapour that firſt appeared as cloud was pure white, in detached fleeces, increaſing as they roſe: they preſently coaleſced, and formed, as he expreſſes it, a ſea of cotton, tufting here and there by the action of the air in the undiſturbed part of the clouds. The whole became an extended white floor of cloud, the upper ſurface being ſmooth and even. Above this white floor he obſerved, at great and unequal diſtances, a vaſt aſſemblage of thunder-clouds. each parcel conſiſting of whole acres in the denſeſt form: he compares their form and appearance to the ſmoke of pieces of ordnance, which had conſolidated as it were into maſſes of ſnow, and penetrated through the upper ſurface or white floor of common clouds, there remaining viſible and at reſt. Some clouds had motions in ſlow and various directions, forming an appearance truly ſtupendous and majeſtic. He endeavours to convey ſome idea of the ſcene by a figure; (and from which fig. 13. of Plate III. is copied). *A* repreſents a circular view he had from the car of the ball, himſelf being over the centre of the view, looking down on the white floor of clouds and ſeeing the city of Cheſter through an opening, which diſcovered the landſcape below, limited by ſurrounding vapour, to leſs than two miles in diameter. The breadth of the outer margin defines his apparent height in the balloon (viz. 4 miles) above the white floor of clouds. Mr Baldwin alſo gives a curious deſcription of his tracing the ſhadow of the balloon over tops of volumes of clouds. At firſt it was ſmall, in ſize and ſhape like an egg; and ſoon encreaſed to the magnitude of the ſun's diſc, ſtill growing larger, and attended with a moſt captivating appearance of an iris encircling the whole ſhadow at ſome diſtance round it, the colours of which were remarkably brilliant. The regions did not feel colder, but rather warmer, than below. The ſun was hotteſt to him when the balloon was ſtationary. The diſcharge of a cannon when the balloon was at a conſiderable height, was diſtinctly heard by the aeronaut; and a diſcharge from the ſame piece, when at the height of 30 yards, ſo diſturbed him as to oblige him for ſafety to lay hold firmly of the cords of the balloon. At a conſiderable height he poured down a pint-bottle full of water; and as the air did not oppoſe a reſiſtance ſufficient to break the ſtream into ſmall drops, it moſtly fell down in large drops. In the courſe of the balloon's tract it was found much affected by the water (a circumſtance obſerved in former aerial voyages). At one time the direction of the balloon kept continually over the water, going directly towards the ſea, ſo much as to endanger the aeronaut; the mouth of the balloon was opened, and he in two minutes deſcended into an under current blowing from the ſea: he kept deſcending, and landed at Bellair farm in Rinſley, 12 miles from Cheſter. Here he lightened his car by 31 pounds, and inſtantly reaſcending, was carried into the interior part of the country, performing a number of different manœuvres. At his greateſt altitude he found his reſpiration free and eaſy. Several bladders which he had along with him crackled and expanded very conſiderably. Clouds and land, as before, appeared on the ſame level. By way of experiment, he tried the upper valve two or three times, the neck of the balloon being cloſe; and remarked, that the eſcape of the gas was attended with a growling noiſe like millſtones, but not near ſo loud. Again, round the ſhadow of the balloon, on the clouds he obſerved the iris.” A variety of other circumſtances and appearances he met with, is fancifully deſcribed; and at 53 minutes paſt three he finally landed.

The frequency of aerial voyages, accompanied with particular details of trifling and unintereſting circumſtances, and apparently made with a view to promote the intereſt of particular perſons, regardleſs of any advancement in knowledge, have now ſunk the ſcience of aeroſtation ſo low in the opinion of moſt people, that before giving any account of the moſt proper method of conſtructing theſe machines, it may ſeem neceſſary to premiſe ſomething concerning the uſes to which they may poſſibly be applied. Theſe, according to Mr Cavallo, are the following.

36 Uſes of aeroſtation. “The ſmall balloons, eſpecially thoſe made of paper, and raiſed by means of ſpirit of wine, may ſerve to explore the direction of the winds in the upper regions of the atmoſphere, particularly when there is a calm below: they may ſerve for ſignals in various circumſtances, in which no other means can be uſed; and letters or other ſmall things may be eaſily ſent by them, as, for inſtance, from ſhips that cannot ſafely land on account of ſtorms, from beſieged places, iſlands, or the like. The larger aeroſtatic machines may anſwer all the abovementioned purpoſes in a better manner, and they may, beſides, be uſed as a help to a perſon who wants to aſcend a mountain, a precipice, or to croſs a river: and perhaps one of thoſe machines tied to a boat by a long rope, may be, in ſome caſes, a better ſort of ſail than any that is uſed at preſent. The largeſt ſort of machines, which can take up one or more men, may evidently be ſubſervient to various œconomical and philoſophical purpoſes. Their conveying people from place to place with great ſwiftneſs, and without trouble, may be of eſſential uſe, even if the art of guiding them in a direction different from that of the wind ſhould never be diſcovered. By means of thoſe machines the ſhape of certain ſeas and lands may be better aſcertained; men may aſcend to the tops of mountains they never viſited before; they may be carried over marſhy

and dangerous grounds; they may by that means come out of a beſieged place, or an iſland; and they may, in hot climates, aſcend to a cold region of the atmoſphere, either to refreſh themſelves, or to obſerve the ice, which is never ſeen below; and, in ſhort, they may be thus taken to ſeveral places, to which human art hitherto knew of no conveyance.

"The philoſophical uſes, to which theſe machines may be ſubſervient, are numerous indeed; and it may be ſufficient to ſay, that hardly any thing which paſſes in the atmoſphere is known with preciſion, and that principally for want of a method of aſcending into it. The formation of rain, of thunder-ſtorms, of vapours, hail, ſnow, and meteors in general, require to be attentively examined and aſcertained. The action of the barometer, the rarefaction and temperature of the air in various regions, the deſcent of bodies, the propagation of ſound, &c. are ſubjects which all require a ſeries of obſervations and experiments, the performance of which could never have been properly expected before the diſcovery of aeroſtatic machines."

To thoſe uſes we may add the gratification of curioſity and pleaſure as a very ſtrong inducement to the practice of an art, in which, with any tolerable degree of caution, there appears not to be the ſmalleſt danger. Every one who has tried the experiment teſtifies, that the beauty of the proſpect afforded by an aſcent, or the pleaſure of being conveyed through the atmoſphere, cannot be exceeded. No one has felt the leaſt of that giddineſs conſequent upon looking from the top of a very high building or of a precipice, nor have they any of the ſickneſs ariſing from the motion of a veſſel at ſea. Many have been carried by balloons at the rate of 30, 40, or even 50 miles an hour, without feeling the leaſt inconvenience, or even agitation of the wind; the reaſon of which is, that as the machine moves nearly with the velocity of the wind itſelf, they are always in a calm, and without uneaſineſs. Some have apprehended danger from the electricity of the atmoſphere; and have thought that a ſtroke of lightning, or the ſmalleſt electric ſpark, happening near a balloon, might ſet fire to the inflammable air, and deſtroy both the machine and the adventurers. Mr Cavallo has ſuggeſted ſeveral conſiderations for diminiſhing apprehenſions of this kind. Balloons have been already raiſed in every ſeaſon of the year, and even when thunder has been heard, without injury. In caſe of danger, the aeronauts may either deſcend to the earth, or aſcend above the region of the clouds and thunder-ſtorms. Beſides, as balloons are formed of materials that are not conductors of electricity, they are not likely to receive ſtrokes, eſpecially as by being encompaſſed with air they ſtand inſulated. Moreover, inflammable air by itſelf, or unmixed with a certain quantity of common air, will not burn; ſo that if an electric ſpark ſhould happen to paſs through the balloon it would not ſet fire to the inflammable air, unleſs a hole was made in the covering.

37
Principles of aeroſtation.

The general principles of aeroſtation are ſo little different from thoſe of hydroſtatics, that it may ſeem ſuperfluous to inſiſt much upon them. It is a fact univerſally known, That when a body is immerſed in any fluid, if its weight be leſs than an equal bulk of that fluid, it will riſe to the ſurface; but if heavier, it will ſink; and if equal, it will remain in the place where it is left. For this reaſon ſmoke aſcends into the atmoſphere, and heated air in that which is colder. The aſcent of the latter is ſhown in a very eaſy and ſatiſfactory manner by bringing a red-hot iron under one of the ſcales of a balance, by which the latter is inſtantly made to aſcend; for as ſoon as the red-hot iron is brought under the ſcale, the hot air being lighter than that which is colder, aſcends, and ſtrikes the bottom, which is thus impelled upwards, and the oppoſite ſcale deſcends, as if a weight had been put into it.

38
Experiments ſhowing the impulſe of heated air.

Upon this ſimple principle depends the whole theory of aeroſtation: for it is the ſame thing whether we render the air lighter by introducing a quantity of heat into it, or incloſing a quantity of gas ſpecifically lighter than the common atmoſphere in a certain ſpace; both will aſcend, and for the ſame reaſon. A cubic foot of air, by the moſt accurate experiments, has been found to weigh about 554 grains, and to be expanded by every degree of heat, marked on Fahrenheit's thermometer, about $\frac{1}{500}$th part of the whole. By heating a quantity of air, therefore, to 500 degrees of Fahrenheit, we will juſt double its bulk when the thermometer ſtands at 54 in the open air, and in the ſame proportion we will diminiſh its weight; and if ſuch a quantity of this hot air be incloſed in a bag, that the exceſs of the weight of an equal bulk of common air weighs more than the bag with the air contained in it, both the bag and air will riſe into the atmoſphere; and continue to do ſo until they arrive at a place where the external air is naturally ſo much rarefied that the weight becomes equal; and here the whole will float.

The power of hot air in raiſing weights, or rather that by which it is itſelf impelled upwards, may be ſhown in the following manner: Roll up a ſheet of paper into a conical form, and, by thurſting a pin into it near the apex, prevent it from unrolling. Faſten it then, by its apex, under one of the ſcales of a balance by means of a thread, and, having properly counterpoiſed it by weights, put it into the oppoſite ſcale; apply the the flame of a candle underneath, you will inſtantly perceive the cone to ariſe, and it will not be brought into equilibrium with the other but by a much greater weight than thoſe who have never ſeen the experiment would believe. If we try this experiment with more accuracy, by getting proper receptacles made which contain determinate quantities of air, we will find that the power of the heat depends much more on the capacity of the bag which contains it than could well be ſuppoſed. Thus, let a cubical receptacle be made of a ſmall wooden frame covered with paper capable of containing one foot of air, and let the power of a candle be tried with this as above directed for the paper cone. It will then be found that a certain weight may be raiſed; but a much greater one will be raiſed by having a receptacle of the ſame kind which contains two cubic feet; a ſtill greater by one of three feet; a yet greater by one of four feet, &c. and this even though the very ſame candle be made uſe of; nor is it known to what extent even the power of this ſmall flame might be carried.

39
Rarefied air balloons ought to be made as large as poſſible.

From theſe experiments it appears, that in the aeroſtatic machines conſtructed on Montgolfier's plan, it muſt be an advantage to have them as large as poſſible;

becauſe a ſmaller quantity of fire will then have a greater effect in raiſing them, and the danger from that element, which in this kind of machines is chiefly to be dreaded, will be in a great meaſure avoided.

40 How balloons might riſe by the common heat of the atmoſphere.

On this ſubject it may be remarked, that as the cubical contents of a globe, or any other figure of which balloons are made, increaſe much more rapidly than their ſurfaces, there muſt ultimately be a degree of magnitude at which the ſmalleſt imaginable heat would raiſe any weight whatever. Thus, ſuppoſing any aeroſtatic machine capable of containing 500 cubic feet, and the air within it to be only one degree hotter than the external atmoſphere; the tendency of this machine to riſe even without the application of artificial heat, would be near an ounce. Let its capacity be increaſed 16 times; and its tendency to riſe will be equivalent to a pound, though this may be done without making the machine 16 times heavier than before. It is certain, however, that all aeroſtatic machines have a tendency to produce or preſerve heat within them, which would by no means be imagined by thoſe who have not made the experiment. When Meſſrs Charles and Robert made their longeſt aerial voyage of 150 miles, they had the curioſity to try the temperature of the air within their balloon, in compariſon with that of the external atmoſphere; and at this time they found, that, when the external atmoſphere was 63°, the thermometer within the balloon ſtood at 104°. Such a difference of temperature muſt have given a machine of the magnitude wich carried them a conſiderable aſcending power independent of any other cauſe, as it amounted to 41 grains on every cubic foot; and therefore in a machine containing 50,000, ſuch feet would have been almoſt 200 pounds.

41 A balloon at Dijon riſes thus into the atmoſphere.

Hence we may eaſily account for what happened at Dijon, and is recorded by Mr Morveau. "A balloon, intended to be filled with inflammable air, being compleated, was, by way of trial, filled with common air, and in that ſtate expoſed to the atmoſphere. Now it was obſerved, and indeed a ſimilar obſervation had been made before, that the air within the balloon was much hotter than the circumambient air: the thermometer in the former ſtood at 120°; whereas in the latter, even when the ſun ſhone upon it, the thermometer ſtood at 84°. This ſhowed a conſiderable degree of rarefaction within the balloon; and conſequently it was ſuſpected, that, by means of this rarefaction alone, eſpecially if it were to increaſe a little, the balloon might aſcend. On the 30th of May, about noon, the wind being rather ſtrong, agitated the balloon ſo that two men were employed to take care of it; but, notwithſtanding all their endeavours, it eſcaped from its confinement, and, lifting up about 65 pounds weight of cords, equatorial circle, &c. roſe many feet high, and, paſſing over ſome houſes, went to the diſtance of 250 yards, where at length it was properly ſecured."

42 Internal heat of the balloons has great influence on aerial voyages.

This difference between the external and internal heat being ſo very conſiderable, muſt have a great influence upon aeroſtatic machines, and will undoubtedly influence thoſe filled with inflammable air as well as the other kind. Nor is it unlikely, that the ſhort time which many aerial voyagers have been able to continue in the atmoſphere, may have been owing to the want of a method of preſerving this internal heat. It may naturally be ſuppoſed, and indeed it has always been found, that balloons, in paſſing through the higher regions of the atmoſphere, acquire a very conſiderable quantity of moiſture, not only from the rain or ſnow they ſometimes meet with, but even from the dew and vapour which condenſes upon them. On this an evaporation will inſtantly take place; and, as it is the property of this operation to produce a very violent cold, the internal heat of the balloon muſt be ſoon exhauſted in ſuch a manner as to make it become ſpecifically heavier than the common atmoſphere, and conſequently deſcend in a much ſhorter time than it would have done by the mere loſs of air.

43 Great tendency of Mr Blanchard's balloon to deſcend accounted for

To this, in all probability, we are to aſcribe the deſcent of the balloon which carried Meſſrs Blanchard and Jeffries; and which ſeemed ſo extraordinary to many people, that they were obliged to have recourſe to an imaginary attraction in the waters of the ocean in order to ſolve the phenomenon. This ſuppoſition is rejected by Mr Cavallo; who explains the matter, by remarking, that in two former voyages made with the ſame machine, it could not long ſupport two men in the atmoſphere; ſo that we had no occaſion to wonder at its weakneſs on this occaſion. "As for its riſing higher (ſays he) juſt when it got over the land, that may be eaſily accounted for. In the firſt place, the two travellers threw out their clothes juſt about that time; ſecondly, in conſequence of the winds then increaſing, the balloon travelled at a much greater rate than it had done whilſt over the ſea; which increaſe of velocity leſſened its tendency to deſcend: beſides which, the viciſſitudes of heat and cold may produce a very conſiderable effect; for if we ſuppoſe, that the air over the land was colder than that over the ſea, the balloon coming into the latter from the former, continued to be hotter than the circumambient air for ſome time after; and conſequently, it was comparatively much lighter when in the cold air over the land, than when in the hotter air over the ſea: hence it floated eaſier in the former than in the latter caſe."

It ſeems indeed very probable, that there was ſomething uncommon in the caſe of Mr Blanchard's balloon while paſſing over the ſea; for, as it roſe higher after reaching the land than in any former period of the voyage, and likewiſe carried them to the diſtance over land more than half of that which they had paſſed over water, we can ſcarce avoid ſuppoſing, that it had a tendency to deſcend when over the water more than when over land, independent of any loſs of air. Now, it does not appear that the air over the ſea is at all warmer than that above land: on the contrary, there is every reaſon to believe, that the ſuperior reflective power of the land renders the atmoſphere above it warmer than the ſea can do: but it is very natural to ſuppoſe, that the air above the ſea is more moiſt than that above land: and conſequently, by letting fall its moiſture upon the balloon, muſt have occaſioned an evaporation that would deprive the machine of its internal heat, which it would partly recover after it entered the warmer and drier atmoſphere over land.

44 Conſtruction of aeroſtatic machines.

We ſhall now proceed to the conſtruction of aeroſtatic machines; of which the ſmaller are only for amuſement, or ſome ſlight experiments, and are very eaſily made. As in all of them, however, it is of the utmoſt conſequence to have the weight as little as poſſible, the ſhape becomes an object of great conſidera-

tion,

45
Of their ſhape.

tion. For this purpoſe a ſpherical figure has been mathematically demonſtrated to be the beſt; as capable of containing a greater quantity under a ſmaller ſurface than any other. Thus a perfect ſphere contains leſs ſurface in proportion to its ſolidity than a ſpheroid; a ſpheroid leſs than a cylinder; the latter leſs than a cube; and a cube ſtill leſs than a parallelopiped. In all caſes, therefore, where we can fill the whole capacity of the balloon with air equally light, the ſpherical figure is undoubtedly to be preferred; and this holds good with regard to all inflammable air-balloons, whether their ſize be great or ſmall; but in the rarefied air ones, where the under part muſt neceſſarily be much colder than the upper, the globular ſhape ſeems not ſo proper. An inverted cone, or truncated pyramid, with the ſmaller part undermoſt, ſeems then to be moſt proper, as it allows the heated air (which has a great tendency to expand as well as to aſcend) to collect in the wide part at the top, while the uſeleſs ſurface in the lower part, and which, in any other figure, would contain only the colder and heavier air, is thus thrown aſide. In fact, it has been found, that aeroſtatic machines, raiſed by means of rarefied air, when made of the ſhape of a parallelopiped, or even one deviating ſtill more from the ſhape of a globe, have anſwered the purpoſe as well as they could have been ſuppoſed to do, had ever ſo much care been taken in forming them exactly to that ſhape. The very firſt machine made by Mr Montgolfier was in form of a parallelopiped; and though it contained only 40 cubic feet, ſhowed a very conſiderable power of aſcent. A very large one, 74 feet high, which Mr Montgolfier had deſigned to exhibit before the royal family, had the middle part of it priſmatic for about the height of 25 feet; its top was a pyramid of 29 feet; and its lower part was a truncated cone of near 20 feet. It weighed 1000 pounds; and, notwithſtanding its ſhape, in a very ſhort time manifeſted a power of aſcent equal to 500 pounds. Another aeroſtatic machine of a ſmaller ſize, but of the figure of a parallelopiped, being ſuffered to aſcend with 30 ſheets of oiled paper fixed to a wire frame, and ſet on fire, roſe to a great height, and in 22 minutes could not be ſeen. It ſeems, therefore, that, with regard to the ſhape of theſe machines, it is by no means neceſſary to adhere rigidly to that of a ſphere; but that any oblong form anſwers very well.

46
Materials.

For experimental purpoſes, both the inflammable and rarefied air-balloons may be made of paper; the former being made of that kind called *thin-poſt*, varniſhed over with linſeed-oil: the latter either of that or any other kind, without varniſh. In order to avoid the danger of burning, however, it has been propoſed to impregnate the paper of which theſe ſmall rarefied air-balloons are made with ſolution of ſal-ammoniac, alum or ſome other ſalt; but this does not ſeem to be neceſſary. Thoſe filled with inflammable air have been made of gold-beater ſkin or peeled bladders; but the cheaper material of paper is undoubtedly preferable.

47
Beſt varniſh for inflammable-air balloons, according to Mr de St Fond.

For aeroſtatic machines of a larger ſize, the material univerſally employed is varniſhed ſilk; and for thoſe of the rarefied air kind, linen painted over with ſome ſize colour, or lined with paper. The beſt varniſh for an inflammable air-balloon is that made with bird-lime, and recommended by Mr Faujas de Saint-Fond, in a treatiſe publiſhed on the ſubject. The following is his method of preparing it: "Take one pound of birdlime, put it into a new proper earthen pot that can reſiſt the fire, and let it boil gently for about one hour, viz. till it ceaſes to crackle; or, which is the ſame thing, till it is ſo far boiled, as that a drop of it being let fall upon the fire will burn: then pour upon it a pound of ſpirits of turpentine, ſtirring it at the ſame time with a wooden ſpatula, and keeping the pot at a good diſtance from the flame, leſt the vapour of this eſſential oil ſhould take fire. After this, let it boil for about ſix minutes longer; then pour upon the whole three pounds of boiling oil of nuts, linſeed, or poppy, rendered drying by means of litharge; ſtir it well, let it boil for a quarter of an hour longer, and the varniſh is made. After it has reſted for 24 hours, and the ſediment has gone to the bottom, decant it into another pot; and when you want to uſe it, warm and apply it with a flat bruſh upon the ſilk ſtuff, whilſt that is kept well ſtretched. One coat of it may be ſufficient; but if two are neceſſary, it will be proper to give one on each ſide of the ſilk, and to let them dry in the open air while the ſilk remains extended."

48
Mr Cavallo's method.

Mr Cavallo gives the following method of preparing this varniſh, which he prefers to that of M. de St Fond.—"In order to render linſeed-oil drying, boil it with two ounces of ſaccharum ſaturni and three ounces of litharge, for every pint of oil, till the oil has diſſolved them, which will be accompliſhed in half an hour; then put a pound of birdlime and half a pint of the drying oil into a pot (iron or copper pots are the ſafeſt for this purpoſe), the capacity of which may be equal to about one gallon, and let it boil very gently over a ſlow charcoal fire till the birdlime ceaſes to crackle, which will be in about half or three quarters of an hour; then pour upon it two pints and a half more of drying oil, and let it boil for one hour longer, ſtirring it very frequently with an iron or wooden ſpatula. As the varniſh, whilſt boiling, and eſpecially when it is nearly done, ſwells very much, care ſhould be had to remove, in thoſe caſes, the pot from the fire, and to replace it when the varniſh ſubſides, otherwiſe it will boil over. Whilſt the ſtuff is boiling, the operator ſhould, from time to time, examine whether the varniſh has boiled enough; which is thus known:—Take ſome of it upon the blade of a knife, and then, after rubbing the blade of another knife upon it, ſeparate the knives; and when, on this ſeparation, the varniſh begins to form threads between the two, you may conclude that it is done; and, without loſing time, it muſt be removed from the fire. When it is almoſt, though not quite, cold, add about an equal quantity of ſpirit of turpentine: mix it well together, and let it reſt till the next day; when, having warmed it a little, ſtrain and bottle it. If it is too thick, add ſome more ſpirit of turpentine. When this varniſh is laid upon the ſilk, the ſtuff ſhould be made perfectly dry, and ſtretched; ſo that the varniſh, which ought to be uſed lukewarm, may fill up the pores of the ſtuff. The varniſh ſhould be laid once very thin upon one ſide of the ſtuff; and, about 12 hours after, two other coats of it ſhould be laid on, one on each ſide; and, 24 hours after, the ſilk may be uſed, though, in cold weather, it may be left to dry ſome time longer."

Much has been ſaid in France of their elaſtic gum-varniſh, and its compoſition kept a ſecret; but Mr Baldwin, after many expenſive trials, declares to the world what he conſiders as the ſecret; and it is merely this: "Take any quantity of caoutchouc, as two ounces averdupois; cut it into ſmall bits with a pair of ſciſſars; put a ſtrong iron ladle (like that uſed by plumbers) over a common pitcoal or other fire. The fire muſt be gentle, glowing, and without ſmoke. When the ladle is hot, much below a red heat, put a ſingle bit into the ladle. If *black* ſmoke iſſues, it will preſently flame and diſappear, or it will evaporate without flame: the ladle is then too hot. When the ladle is leſs hot, put in a ſecond bit, which will produce a *white* ſmoke. This *white* ſmoke will continue during the operation, and evaporate the caoutchouc: therefore no time is to be loſt; but little bits are to be put in, a few at a time, till the whole are melted. It ſhould be continually and gently ſtirred with an iron or braſs ſpoon. Two pounds or one quart of the beſt drying oil (or of raw linſeed-oil, which, together with a few drops of neats-foot oil, has ſtood a month, or not ſo long, on a lump of quicklime, to make it more or leſs drying), is to be put into the melted caoutchouc, and ſtirred till hot, and the whole poured into a glazed veſſel, through a courſe gauze or fine ſieve. When ſettled and clear, which will be in a few minutes, it will be fit for uſe, either hot or cold." Mr Baldwin is not at liberty, he obſerves, to publiſh the art of laying on the varniſh: but ſays, that it conſiſts in making no *inteſtine motion* in the varniſh, which would create minute bubbles; that therefore bruſhes are improper. Mr Blanchard's method of making elaſtic-gum varniſh for the ſilk of a balloon, is the following. "Diſſolve elaſtic gum (caoutchouc) cut ſmall in five times its weight of ſpirit of turpentine, by keeping them ſome days together; then boil one ounce of this ſolution in eight ounces of drying linſeed-oil for a few minutes; laſtly, ſtrain it. It muſt be uſed warm." The pieces of ſilk for the balloon muſt be cut out of a proper ſize, according to the dimenſions, after the varniſh is ſufficiently dry. They may be joined by laying about half an inch of the edge of one piece over the edge of the other, and ſewing them by a double ſtitching. Mr Blanchard uſes expeditiouſly the following method. He lays about half an inch of the edge of one piece flat over the edge of the other, and paſſes a hot iron over it; in doing which a piece of paper ought to be laid both under and over the ſilk. The joining may be rendered more ſecure by running it with a ſilk thread, and ſticking a ribband over it. The ribbands laid over ſeams may be ſtuck with common glue, provided the varniſh of the ſilk is properly dried. When the glue is quite dry, the ribbands ſhould be varniſhed over, to prevent their being unglued by the rain.

49
Of cutting the gores for a globe.

Plate III. fig. 5.

The beſt method of cutting the pieces of ſilk that are to form a balloon, is to deſcribe a pattern of wood or ſtiff card-paper, and then to cut the ſilk upon it. As the edges of ſuch a pattern are not perfect circles, they cannot be deſcribed by a pair of compaſſes: but the beſt method of drawing them is as follows. Firſt, draw on a flat ſurface two right lines AE and BC, perpendicular to each other. Secondly, find the circumference anſwering to the given diameter of the balloon in feet and decimals of a foot; and make AD and DE each equal to a quarter of the circumference, ſo that the whole length AE of the pattern may be equal to half the circumference. Thirdly, divide AD into 18 equal parts; and to the points of diviſion apply the lines *fg*, *hi*, *kl*, &c. parallel to each other, and perpendicular to AD. Fourthly, divide the whole circumference in twice the given number of pieces, and make DC and BB each equal to the quotient of this diviſion; ſo that the whole, BC, is equal to the greateſt breadth of one of theſe pieces. Fifthly, multiply the above-mentioned quotient by the decimals annexed to *fg*, viz. 0.99619, and then the product expreſſes the length of *fg*: again multiply the ſame length of DE by the decimals annexed to *hi*, and the product expreſſes the length of *hi*; and, in ſhort, the product ariſing from the multiplication of the length of DC by the decimals annexed to each of the parallel lines, gives the length of that line. Laſtly, having found the lengths of all theſe lines, draw by hand a curve-line paſſing through all the extremities of the ſaid lines, and that is the edge of one quarter of the pattern. The other quarters may be eaſily deſcribed, by applying to them a piece of paper cut according to the that already found.—Suppoſe, for example, that the diameter of the balloon to be conſtructed is 20 feet, and that it is required to make it of 12 pieces: then, in order to draw the pattern for thoſe pieces, find the circumference of the balloon, which is 62.83 feet, and, dividing it by four, the quotient is 15.7 feet; make therefore AD equal to 15.7 feet, and DE likewiſe of the ſame length. Divide the circumference 62.83 by 24, which is double the number of pieces that are to form the balloon, and the quotient, 2.618 feet, is the length of DC and likewiſe of BD; ſo that BC is equal to 5.236 feet. Then, having divided the line AD into 18 equal parts, and having drawn the parallel lines from thoſe points of diviſion, find the length of each of theſe lines by multiplying 2.618 by the decimals annexed to that line. Thus, 2.618, multiplied by 0.99619, gives 2.608 feet for the length of *fg*; and again, multiplying 2.618 by 0.98481, gives 2.578 feet for the length of *hi*; and ſo of the reſt.—In cutting the pieces after ſuch a pattern, care ſhould be taken to leave them about three quarters of an inch all round larger than the pattern, which will be taken up by the ſeams.

To the upper part of the balloon there ſhould be adapted, and well fitted in, a valve opening inwards; to which ſhould be faſtened a ſtring paſſing through a hole made in a ſmall piece of round wood fixed in the lower part of the balloon oppoſite to the valve, the end of this ſtring faſtened to the car below, ſo that the aeronaut may open the valve when occaſion requires. The action of this valve may be underſtood from fig. 6. A round braſs plate AB has a round hole CD, about two or three inches diameter, covered on both ſides with ſtrong ſmooth leather. On the inſide there is a ſhutter E, alſo of braſs, covered with leather, which is to cloſe the hole CD; being about two inches larger in diameter than the hole. It is faſtened to the leather of the plate AB; and by a ſpring, which need not be very ſtrong, it is kept againſt the hole. The elaſticity of the gas itſelf will help to keep it ſhut. To this ſhutter the ſtring is faſtened, by which it is occaſionally opened for the eſcape of gas. A ſmall

Plate III

ACOUSTICS

Fig 1

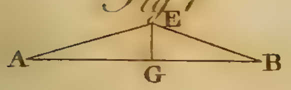


Fig 3

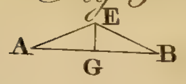


Fig 2

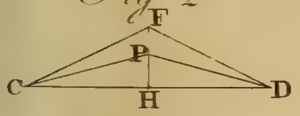
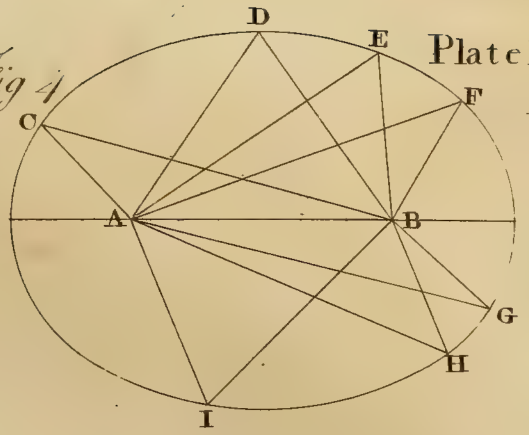


Fig 4



AEROSTATION

Fig 12

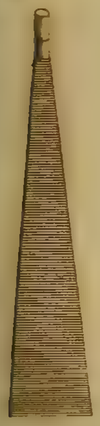
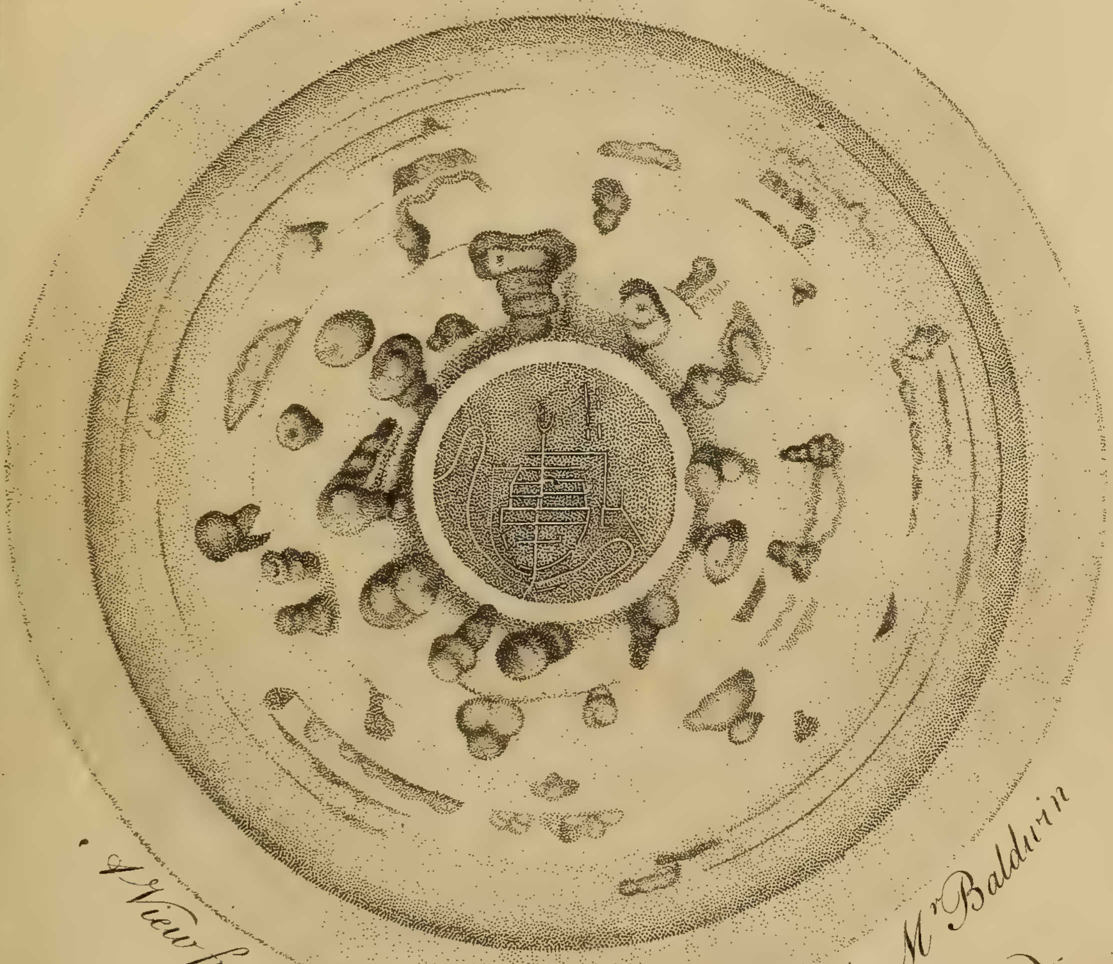


Fig 6

Fig 13



A View from a Balloon above the clouds seen by Mr Baldwin

Fig 5

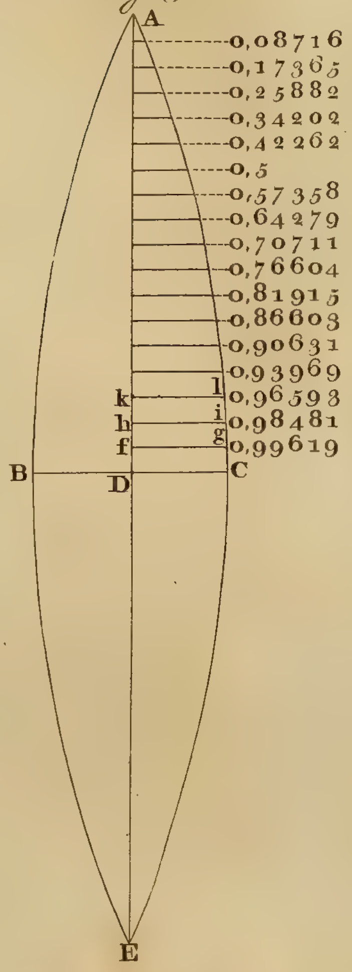


Fig 11

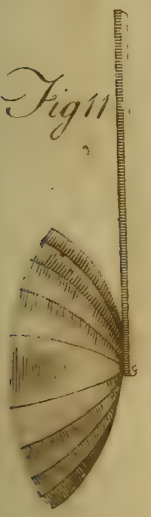


Fig 10

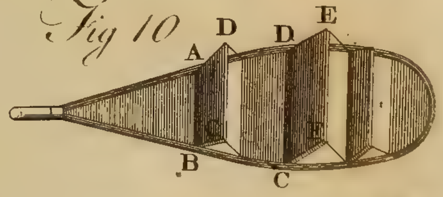


Fig 8

Fig 9

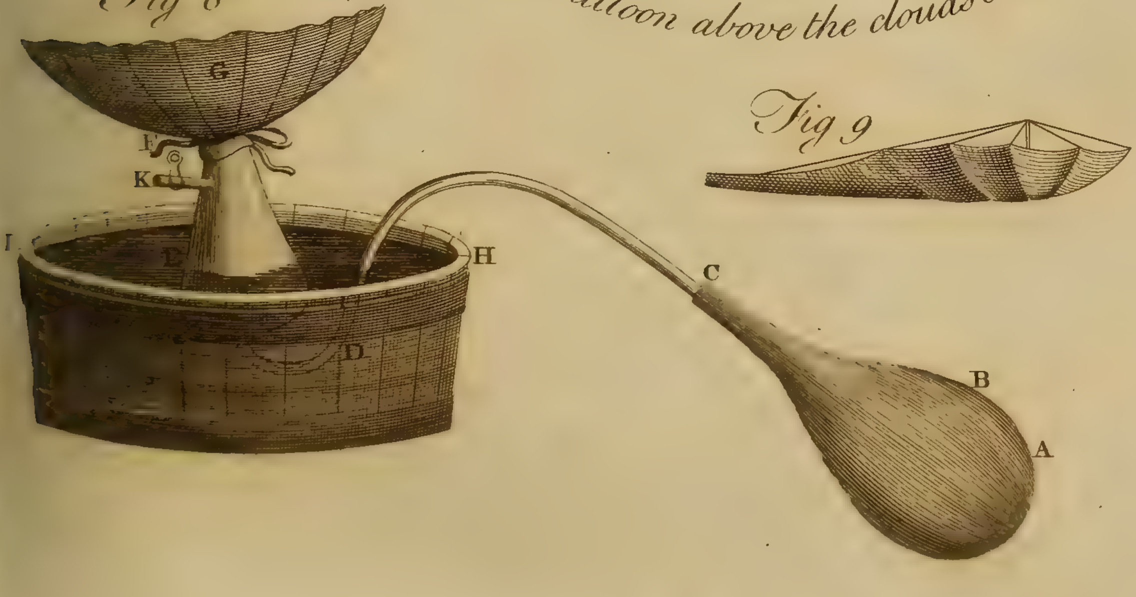
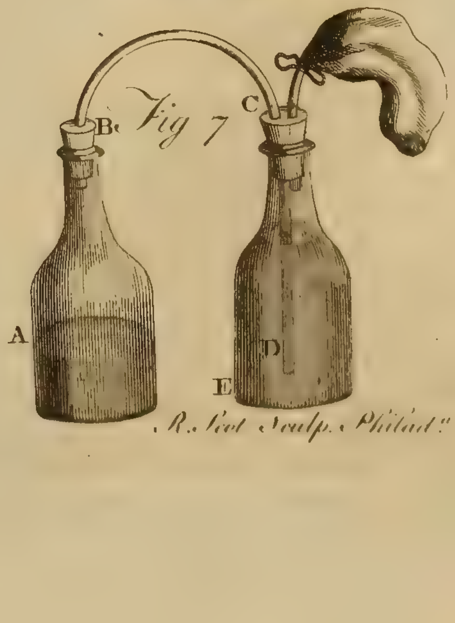


Fig 7



R. Scot Sculp. Philad.

ſtring or other ſecurity ſhould be fixed to the ſhutter and the plate, ſo as not to admit the ſhutter to be opened beyond a certain ſafe diſtance. To the lower part of the balloon two pipes ſhould be fixed, made of the ſame ſtuff as the envelope; 6 inches diameter for a balloon of 30 feet, and proportionally larger for balloons of a greater capacity. They muſt be long enough for the car. For balloons of 18 feet and leſs diameter, one neck or pipe will be ſufficient. Theſe pipes are the apertures through which the inflammable gas is introduced into the balloon.

The car or boat is beſt made of wicker-work, covered with leather, and well painted or varniſhed over; and the proper method of ſuſpending it, is by ropes proceeding from the net which goes over the balloon. This net ſhould be formed to the ſhape of the balloon, and fall down to the middle of it, with various cords proceeding from it to the circumference of a circle about two feet below the balloon; and from that circle other ropes ſhould go to the edge of the boat. This circle may be made of wood, or of ſeveral pieces of ſlender cane bound together. The meſhes of the net may be ſmall at top, againſt which part of the balloon the inflammable air exerts the greateſt force; and increaſe in ſize as they recede from the top. A hoop has ſometimes been applied round the middle of the balloon to faſten the net. This, though not abſolutely neceſſary, is beſt made of pieces of cane bound together, and covered with leather.

With regard to the rarefied-air machines, Mr Cavallo recommends firſt to ſoak the cloth in a ſolution of ſal-ammoniac and common ſize, uſing one pound of each to every gallon of water; and when the cloth is quite dry, to paint it over in the inſide with ſome earthy colour, and ſtrong ſize or glue. When this paint has dried perfectly, it will then be proper to varniſh it with oily varniſh, which might dry before it could penetrate quite through the cloth. Simple drying linſeed oil will anſwer the purpoſe as well as any, provided it be not very fluid.

50
Of filling aerostatic machines.

It now only remains to give ſome account of the method by which aeroſtatic machines may be filled with their proper gas, in order to give them their power of aſcending into the atmoſphere; and here we are enabled to determine with much greater preciſion concerning the inflammable-air balloons than the others.

51
Method of procuring inflammable air.

With regard to them, a primary conſideration is, the moſt proper method of procuring the inflammable air. It may be obtained in various ways, as has been ſhown under the article AEROLOGY; but the moſt advantageous methods are, by applying acids to certain metals; by expoſing animal, vegetable, and ſome mineral ſubſtances, in a cloſe veſſel to a ſtrong fire; or by tranſmitting the vapour of certain fluids through red-hot tubes.

1. In the firſt of theſe methods, iron, zinc, and vitriolic acid, are the materials moſt generally uſed. The vitriolic acid muſt be diluted by five or ſix parts of water. Iron may be expected to yield in the common way 1700 times its own bulk of gas; or one cubic foot of inflammable air to be produced by $4\frac{1}{2}$ ounces of iron, the like weight of oil of vitriol, and $22\frac{1}{2}$ ounces of water. Six ounces of zinc, an equal weight of oil of vitriol, and 30 ounces of water, are neceſſary for producing the ſame quantity of gas. It is more proper to uſe the turnings or chippings of great pieces of iron, as of cannon, &c. than the filings of that metal, becauſe the heat attending the efferveſcence will be diminiſhed; and the diluted acid will paſs more readily through the interſtices of the turnings when they are heaped together, than through the filings which ſtick cloſer to one another. The weight of the inflammable air thus obtained by means of acid of vitriol, is, in the common way of procuring it, generally one ſeventh part of the weight of common air; but with the neceſſary precautions for philoſophical experiments, leſs than one-tenth of the weight of common air. Two other ſorts of elaſtic fluids are ſometimes generated with the inflammable air. Theſe may be ſeparated from it by paſſing the inflammable air through water in which quicklime has been diſſolved. The water will abſorb theſe fluids, cool the inflammable air, and prevent its over-heating the balloon when introduced into it.

Fig. 7. of Plate III. repreſents an apparatus deſcribed by Mr Cavallo as proper for filling balloons of the ſize of two or three feet in diameter with inflammable air, after paſſing it through water.—A is the bottle with the ingredients; BCD a tube faſtened in the neck at B, and paſſing through C, the cork of the other bottle, in which there is another hole made to receive the tube on which the balloon is tied. Thus it is plain, that the inflammable air coming out of the tube D will paſs firſt through the water of the bottle E, and then into the balloon. Two ſmall caſks may be uſed inſtead of the bottles A and E.

2. Inflammable air may be obtained at a much cheaper rate by the action of fire on various ſubſtances; but the gas which theſe yield is not ſo light as that produced by the efferveſcence of acids and metals. The ſubſtances proper to be uſed in this way are, pit-coal, aſphaltum, amber, rock-oil, and other minerals; wood, and eſpecially oak, camphor-oil, ſpirits of wine, ether, and animal ſubſtances, which yield air in different degrees, and of various ſpecific gravities; but pit-coal is the preferable ſubſtance. A pound of this expoſed to a red heat, yields about three cubic feet of inflammable air, which, whether it be paſſed through water or not, weighs about one-fourth of the weight of common air. Dr Prieſtley found, as we have elſewhere noticed, that animal or vegetable ſubſtances will yield ſix or ſeven times more inflammable air when the fire is ſuddenly increaſed than when it is gently raiſed, though it be afterwards made very ſtrong. Mr Cavallo obſerves, that the various ſubſtances above enumerated generally yield all their inflammable air in about one hour's time. The general method is, to incloſe the ſubſtances in iron or earthen veſſels, and thus expoſe them to a ſtrong fire ſufficient to make the veſſels red-hot: the inflammable air proceeding from the aperture of the veſſel is received into a tube or refrigeratory, and, paſſing through the tube or worm, is at laſt collected in a balloon or other veſſel. A gun-barrel has often been uſed for eſſays of this kind. The ſubſtance is put into it ſo as to fill ſix or eight inches of its loweſt part, the remainder filled with dry ſand: a tube, adapted to the mouth of the barrel, is brought into a baſin of water under an inverted receiver; and the part of the barrel containing the ſubſtance being put into the fire and made red-hot, the inflammable air is col-

lected in the inverted receiver. As the gun-barrel cannot ſerve for producing a large quantity of inflammable air, Mr Cavallo recommends, as the moſt advantageous ſhape, the following contrivance:—Let the veſſel be made of clay, or rather of iron, in the ſhape of a Florence flaſk, ſomewhat larger, and whoſe neck is longer and larger (See ABC, fig. 8.) Put the ſubſtance to be uſed in this veſſel, ſo as to fill about four-fifths or leſs of its cavity AB. If the ſubſtance is of ſuch a nature as to ſwell much by the action of the fire, lute a tube of braſs, or firſt a braſs and then a leaden tube, to the neck C of the veſſel; and let the end D of the tube be ſhaped as in the figure, ſo that going into the water of a tub HI, it may terminate under a ſort of inverted veſſel EF, to the upper aperture of which the balloon G is adapted. Things thus prepared, if the part AB of the veſſel is put into the fire, and made red-hot, the inflammable air produced will come out of the tube CD, and paſſing through the water will at laſt enter into the balloon G. Previous to the operation, as a conſiderable quantity of common air remains in the inverted veſſel EF, which it is more proper to expel, the veſſel EF ſhould have a ſtop-cock K, through which the common air may be ſucked out, and the water aſcend as high as the ſtop-cock. The dimenſions of ſuch an apparatus Mr Cavallo gives thus: Diameter of largeſt part of the veſſel ABC ſeven inches, length of whole veſſel 16 inches; diameter of its aperture one inch, diameter of the cavity of tube CD three-fourths of an inch; lower aperture of the veſſel EF ſix inches, leaſt height of the veſſel EF 24 inches; its aperture F about two inches. The aperture of the veſſel EF ſhould be at leaſt one foot below the ſurface of the water in HI. Care muſt be taken that the fire uſed in this proceſs be at a ſufficient diſtance, otherwiſe it may happen to fire the inflammable air which may eſcape out of the veſſel EF.

3. The laſt method of obtaining inflammable air was lately diſcovered by Mr Lavoiſier, and alſo by Dr Prieſtley. Mr Lavoiſier made the ſteam of boiling water paſs through the barrel of a gun, kept red-hot by burning coals. Dr Prieſtley uſes, inſtead of the gun-barrel, a tube of red-hot braſs, upon which the ſteam of water has no effect, and which he fills with the pieces of iron which are ſeparated in the boring of cannon. By this method he obtains an inflammable air, the ſpecific gravity of which is to that of common air as 1 to 13. In this method, not yet indeed reduced to general practice, a tube, about three quarters of an inch in diameter, and about three feet long, is filled with iron turnings; then the neck of a retort, or cloſe boiler, is luted to one of its ends, and the worm of a refrigeratory is adapted to its other extremity. The middle part of the tube is then ſurrounded with burning coals, ſo as to keep about one foot in length of it red-hot, and a fire is always made under the retort or boiler ſufficient to make the water boil with vehemence. In this proceſs a conſiderable quantity of inflammable air comes out of the worm of the refrigeratory. It is ſaid that iron yields one half more air by this means than by the action of vitriolic acid.

For filling large balloons, a greater apparatus is neceſſary; and the only materials that can, with any certainty of ſucceſs, be employed for producing the proper gas, are, oil of vitriol, and iron filings or turnings.

52 Mr Cavallo's receipt.

53 Mr Lunardi's method

It has indeed been recommended to uſe zinc inſtead of iron filings, becauſe white vitriol, the ſalt produced by the union of the vitriolic acid and zinc, is much more valuable than the green ſort produced by the union of the ſame acid with iron. But though this is undoubtedly the caſe, it will as certainly be found, upon trial, that the ſuperior price of the zinc will be more than an equivalent for all the advantage that can be derived from the additional price of the white vitriol. For a balloon of 30 feet diameter, Mr Cavallo recommends 3900 pounds of iron turnings, as much oil of vitriol, and 19,500 pounds of water. Theſe proportions, however, appear too great with reſpect to the acid and metal, and too little with reſpect to the water. Oil of vitriol will not exert its power upon iron unleſs it be diluted with five or ſix times its quantity of water; in which caſe, a much ſmaller quantity of both acid and metal will ſerve. Mr Lunardi, who from the number of his voyages had certainly much practical knowledge in aeroſtation, filled his balloon at Edinburgh and Glaſgow with about 2000 pounds of iron (the borings of cannon procured from Carron), as much vitriolic acid, and 12,000 pounds of water. The iron was placed in his veſſels in layers, with ſtraw between them, in order to increaſe the ſurface. His apparatus was not materially different from that of Mr Cavallo, repreſented bottom of Plate I. fig. 2. where AA are two tubs, about three feet in diameter and nearly two feet deep, inverted in large tubs BB filled with water. In the bottom of each of the inverted tubs a hole is made, and a tube E of tin adapted, which is about ſeven inches in diameter, and ſeven or eight long. To theſe tubes the ſilken ones of the balloon are to be tied. Round each of the tubs B, five, ſix, or more ſtrong caſks are placed; in the top of each two holes are made, and to one of theſe holes a tin tube is adapted, and ſo ſhaped, that, paſſing over the edge of the tub B, and through the water, it may terminate with its aperture under the inverted tub A. The other hole of theſe caſks ſerves for the introduction of materials, and is ſtopped with a wooden plug. When the balloon is to be filled, put the net over it, and let it be ſuſpended as ſhown by CDF; and having expelled all the common air from it, let the ſilken tubes be faſtened round the tin ones EE; and the materials being put into the caſks, the inflammable air, paſſing into the balloon, will ſoon diſtend, and render it capable of ſupporting itſelf; after which the rope GH may be ſlipped off. As the balloon continues to be filled, the net is adjuſted properly round it; the cords that ſurround it are faſtened to the hoop MN; then the boat IK being placed between the two ſets of caſks, is faſtened to the hoop MN, and every thing that is required to be ſent up, as ballaſt, inſtruments, &c. is placed in it. At laſt, when the balloon is little more than three quarters full, the ſilken tubes are ſeparated from the tin ones of the inverted tubs, and their extremities being tied up, are placed in the boat. Laſtly, the aeronauts being ſeated in the boat, the lateral ropes are ſlipped off, and the machine is abandoned to the air. (See *Blanchard's balloon*, Plate II.) This apparatus was at laſt reduced by Mr Lunardi to its utmoſt ſimplicity, by uſing only two large caſks, and ſuffering the vapour to go into the balloon without paſſing through water. Thus his balloon was filled in leſs than half an hour, when, before, it had required two hours at leaſt. The ſinking of his caſks in the ground was alſo an additional convenience, as it created no confuſion, and rendered the materials much more eaſily conveyed into them.

54 Of filling rarefied-air balloons.

With regard to the rarefied-air balloons, the method of filling them is as follows. A ſcaffold ABCD, the breadth of which is at leaſt two-thirds of the diameter of the machine, is elevated about ſix or eight feet above the ground. From the middle of it deſcends a well E, riſing about two or three feet above it, and reaching to the ground, furniſhed with a door or two, through which the fire in the well is ſupplied with fuel. The well ſhould be conſtructed of brick or of plaſtered wood, and its diameter ſhould be ſomewhat leſs than that of the machine. On each ſide of the ſcaffold are erected two maſts HI, KL, each of which has a pully at the top, and rendered firm by means of ropes KG, KP, HP, HG. The machine to be filled is to be placed on the ſcaffold, with its neck round the aperture of the well. The rope paſſing over the pullies of the two maſts, ſerves, by pulling its two ends, to lift the balloon about 15 feet or more above the ſcaffold; and the reſt of the machine is repreſented by the dotted lines in the figure MNO. The machine is kept ſteady, and held down, whilſt filling, by ropes paſſing through loops or holes about its equator; and theſe ropes may eaſily be diſengaged from the machine, by ſlipping them through the loops when it is able to ſuſtain itſelf. The proper combuſtibles to be lighted in the well, are thoſe which burn quick and clear, rather than ſuch as produce much ſmoke; becauſe it is hot air, and not ſmoke, that is required to be introduced into the machine. Small wood and ſtraw have been found to be very fit for this purpoſe. Mr Cavallo obſerves, as the reſult of many experiments with ſmall machines, that ſpirits of wine are upon the whole the beſt combuſtible; but its price may prevent its being uſed for large machines. As the current of hot air aſcends, the machine will ſoon dilate, and lift itſelf above the ſcaffold and gallery which was covered by it. The paſſengers, fuel, inſtruments, &c. are then placed in the gallery. When the machine makes efforts to aſcend, this aperture muſt be brought, by means of ropes annexed to it, towards the ſide of the well a little above the ſcaffold; the fire-place is then ſuſpended in it, the fire lighted in the grate, and the lateral ropes being ſlipped off the machine is abandoned to the air. (See *Montgolfier's balloon*, Plate II.) It has been determined by accurate experiments, that only one third of the common air can be expelled from theſe large machines; and therefore the aſcending power of the rarefied air in them can be eſtimated as only equal to half an ounce averdupoiſe for every cubic foot.

The conduct of balloons, when conſtructed, filled, and actually aſcending in the atmoſphere, is an object of great importance in the practice of aeroſtation. The method generally uſed for elevating or lowering the balloons with rarefied air, has been the increaſe or diminution of the fire; and this is entirely at the command of the aeronaut, as long as he has any fuel in the gallery. The inflammable-air balloons have been generally raiſed or lowered by diminiſhing the weight in the boat, or by letting out ſome of the gas through the valve: but the alternate eſcape of the air in deſcending, and diſcharge of the ballaſt for aſcending, will by degrees render the machine incapable of floating; for in the air it is impoſſible to ſupply the loſs of ballaſt, and very difficult to ſupply that of inflammable air. Theſe balloons will alſo riſe or fall by means of the rarefaction or condenſation of the incloſed air, occaſioned by heat and cold. It has been propoſed to aid a balloon in its alternate motion of aſcent and deſcent, by annexing to it a veſſel of common air, which might be condenſed for lowering the machine, and rarefied again, by expelling part of it, for raiſing the machine: But a veſſel adapted to this purpoſe muſt be very ſtrong; and, after all, the aſſiſtance afforded by it would not be very conſiderable. M. Meuneir, in order to attain this end, propoſes to incloſe one balloon filled with common air in another filled with inflammable air: as the balloon aſcends, the inflammable air is dilated, and of courſe compreſſes the internal balloon containing the common air; and by diminiſhing its quantity, leſſens its weight. If it ſhould be neceſſary to ſupply this loſs, he ſays it may be eaſily done by a pair of bellows fixed in the gallery. Others have propoſed to annex a ſmall machine with rarefied air to an inflammable-air balloon by ropes, at ſuch a diſtance that the fire of the former might not affect the inflammable air of the latter: the whole apparatus, thus combined, of balloons formed on the two principles of heated and inflammable air, might be raiſed or lowered by merely increaſing or diminiſhing the fire in the lower balloon.

Wings or oars are the only means of this ſort that have been uſed with ſome ſucceſs; and, as Mr Cavallo obſerves, they ſeem to be capable of conſiderable improvement. Although great effects are not to be expected from them, when the machine goes at a great rate, the beſt methods of moving thoſe wings are by the human ſtrength applied ſimilarly to the oars of a waterman. They may be made in general of ſilk ſtretched between wires, tubes, or ſticks; and when uſed, muſt be turned edgewiſe when they are moved in the direction in which the machine is intended to be impelled, but flat in the oppoſite direction. Fig 9. Plate III. is the repreſentation of one of Mr Blanchard's wings. Fig. 10. is one of thoſe uſed by Mr Lunardi, which conſiſts of many ſilk ſhutters or valves, ABCD, DECF, &c. every one of which opens on one ſide only, viz. ADBC opens upon the line AB, DECF opens upon the line DC, &c. In conſequence of this conſtruction, this ſort of oars do not need being turned edgewiſe. Fig. 11. repreſents one of the wings uſed by the brothers Roberts in the aerial voyage of the 19th September 1784; and fig. 12. repreſents one of the wings conſtructed by Count Zambeccari, which conſiſts of a piece of ſilk ſtretched between two tin tubes ſet at an angle; but theſe wings are ſo contrived as to turn edgewiſe by themſelves when they go on one direction. Other contrivances have been made to direct aeroſtatic machines, but they have moſtly been invented to effect a power upon them as upon a ſhip. It appears, however, that they can have no effect when a machine is only moved by the wind alone, becauſe the circumambient air is at reſt in reſpect to the machine. The caſe is quite different with a veſſel at ſea, becauſe the water on which it floats ſtands ſtill whilſt the veſſel goes on; but it muſt be time and experience that can realize the expectations ſuggeſted by theſe contrivances.

AERSHOT, a town in the Netherlands, in the duchy of Brabant, and the capital of the duchy of Aerſhot. It is ſeated on the river Demur, ten miles eaſt of Malines or Mechlin, and eight north of Louvain. E. Long. 5. 4. N. Lat. 51. 15.

ÆRUGINOUS, an epithet given to ſuch things as reſemble or partake of the nature of the ruſt of copper.

ÆRUGO, in natural hiſtory, properly ſignifies the ruſt of copper, whether natural or artificial. The former is found about copper mines, and the latter, called *verdegris*, made by corroding copper-plates with acids. See *Verdegris*.

ÆRUSCATORES, in antiquity, a kind of ſtrolling beggars, not unlike gypſies, who drew money from the credulous by fortune-telling, &c. It was alſo a denomination given to griping exactors, or collectors of the revenue. The Galli, or prieſts of Cybele, were called *æruſcatores magnæ matris*; and μητραγυρται, on account of their begging or collecting alms in the ſtreets; to which end they had little bells whereby to draw people's attention to them, much like ſome orders of mendicants in ſome parts of Europe.

AERY, or Airy, among ſportſmen. See Airy.

ÆS uxorium, in antiquity, a ſum paid by bachelors, as a penalty for living ſingle to old age. This tax for not marrying ſeems to have been firſt impoſed in the year of Rome 350, under the cenſorſhip of M. Furius Camillus and M. Poſthumus. At the cenſus, or review of the people, each perſon was aſked, *Et tu ex anima ſententia uxorem habes liberum quærendorum cauſa?* He who had no wife was hereupon fined after a certain rate, called *æs uxorium*.

Æs per et libram was a formula in the Roman law, whereby purchaſes and ſales were ratified. Originally the phraſe ſeems to have been only uſed in ſpeaking of things ſold by weight, or by the ſcales; but it afterwards was uſed on other occaſions. Hence even in adoptions, as there was a kind of imaginary purchaſe; the formula whereof expreſſed, that the perſon adopted was bought *per æs et libram*.

Æs Flavum, yellow copper, among the Romans, an appellation given to the coarſer kinds of braſs.

Æs Caldarium, a term uſed by the German mineraliſts, for a ſubſtance which ſometimes occurs to thoſe who work upon cobalt, and is uſed for the making the fine blue colour called *ſmalt*.

Æs Uſtum, a chemical preparation, made of thin leaves of copper, ſulphur, and nitre, placed *ſtratum ſuper ſtratum* in a crucible, and ſet in a charcoal fire till all the ſulphur is conſumed; after which, the copper is taken out of the crucible, and reduced to powder. Some quench the leaves of copper in vinegar, and repeat the calcination.—Its principal uſe is in colouring glaſs, to which it gives a beautiful tincture. The ſurgeons uſe it as a deterſive, and ſome have given it internally; but it is certainly a very dangerous medicine, and ſhould be avoided.

ÆSCHINES, a Socratic philoſopher, the ſon of Charinus a ſauſage-maker. He was continually with Socrates; which occaſioned this philoſopher to ſay, that the ſauſage-maker's ſon was the only perſon who knew how to pay a due regard to him. It is ſaid that poverty obliged him to go to Sicily to Dionyſius the Tyrant; and that he met with great contempt from Plato, but was extremely well received by Ariſtippus; to whom he ſhowed ſome of his dialogues, and received from him a handſome reward. He would not venture to profeſs philoſophy at Athens, Plato and Ariſtippus being in ſuch high eſteem; but he ſet up a ſchool to maintain himſelf. He afterwards wrote orations for the Forum. Phrynicus, in Photius, ranks him among the beſt orators, and mentions his orations as the ſtandard of the pure Attic ſtyle. Hermogenes has alſo ſpoken very highly of him.—He alſo wrote ſeveral dialogues, of which there are only three extant: 1. Concerning Virtue, whether it can be taught. 2. Eryxias, or Eraſiſtratus; concerning riches, whether they are good. 3. Axiochus; concerning death, whether it is to be feared. Mr Le Clerc has given a Latin tranſlation of them with notes, and ſeveral diſſertations intitled *Sylvæ Philologicæ*.

ÆSCHYLUS, the tragic poet, was born at Athens. Authors differ in regard to the time of his birth, ſome placing it in the 65th, others in the 70th Olympiad; but according to Stanley, who relies on the Arundelian marbles, he was born in the 63d Olympiad. He was the ſon of Euphorion, and brother to Cynegirus and Aminias, who diſtinguiſhed themſelves in the battle of Marathon, and the ſea-fight of Salamis, at which engagements Æſchylus was likewiſe preſent. In this laſt action, according to Diodorous Siculus, Aminias, the younger of the three brothers, commanded a ſquadron of ſhips, and behaved with ſo much conduct and bravery, that he ſunk the admiral of the Perſian fleet, and ſignalized himſelf above all the Athenians. To this brother our poet was, upon a particular occaſion, obliged for ſaving his life: Ælian relates, that Æſchylus being charged by the Athenians with certain blaſphemous expreſſions in ſome of his pieces, was accuſed of impiety, and condemned to be ſtoned to death: they were juſt going to put the ſentence in execution, when Aminias, with a happy preſence of mind, throwing aſide his cloak, ſhowed his arm without a hand, which he had loſt in the battle of Salamis in defence of his country. This ſight made ſuch an impreſſion on the judges, that, touched with the remembrance of his valour, and with the friendſhip he ſhowed for his brother, they pardoned Æſchylus. Our poet however reſented the indignity of this proſecution, and reſolved to leave a place where his life had been in danger. He became more determined in this reſolution when he found his pieces leſs pleaſing to the Athenians than thoſe of Sophocles, tho' a much younger writer. Some affirm, that Æſchylus never ſat down to compoſe but when he had drank liberally. He wrote a great number of tragedies, of which there are but ſeven remaining: and notwithſtanding the ſharp cenſures of ſome critics, he muſt be allowed to have been the father of the tragic art. In the time of Theſpis, there was no public theatre to act upon; the ſtrollers driving about from place to place in a cart. Æſchylus furniſhed his actors with maſks, and dreſſed them ſuitably to their characters. He likewiſe introduced the buſkin, to make them appear more like heroes.—The ancients gave Æſchylus alſo the praiſe of having been the firſt who removed murders and ſhocking ſights from the eyes of the ſpectators. He is ſaid likewiſe to have leſſened the number of the chorus. M. Le Fevre has obſerved, that Æſchylus never repreſented women in love in his tragedies; which, he ſays, was not ſuited to his genius; but, in repreſenting a woman tranſported with fury he was incomparable. Longius ſays, that

Æſchylus has a noble boldneſs of expreſſion; and that his imagination is lofty and heroic. It muſt be owned, however, that he affected pompous words, and that his ſenſe is too often obſcured by figures: this gave Salmaſius occaſion to ſay, that he was more difficult to be underſtood than the ſcripture itſelf. But notwithſtanding theſe imperfections, this poet was held in great veneration by the Athenians, who made a public decree that his tragedies ſhould be played after his death. He was killed in the 69th year of his age, by an eagle letting fall a tortoiſe upon his head as he was walking in the fields. He had the honour of a pompous funeral from the Sicilians, who buried him near the river Gela; and the tragedians of the country performed plays and theatrical exerciſes at his tomb.—The beſt edition of his plays is that of London, 1663, fol. with a Latin tranſlation and a learned commentary by Thomas Stanley.

ÆSCHYNOMENE, BASTARD SENSITIVE-PLANT: A genus of the decandria order, belonging to the diadelphia claſs of plants; the characters of which are: The *calyx* is a one-leav'd campanulated bilabiated perianthium; the lips equal, but the ſuperior one two-cleft, the inferior tridentate. The *corolla* is papillionaceous; the banner cordated and ſubringent; the *alæ* ovate, obtuſe, and ſhorter than the banner; and the carina lunated, pointed, and the length of the alæ. The *ſtamina* conſiſt of 10 ſimple 9-cleft filaments; the antheræ ſmall. The *piſtillum* is an oblong villous columnar germen; the ſtylus ſubulated and aſcending, the ſtigma ſimple and ſomewhat obtuſe. The pericarpium is a long, compreſſed, unilocular jointed pod. The *ſeeds* are kidney-ſhaped, and ſolitary within each joint. Of this genus there are reckoned ſix.

Species. 1. The aſpera (as well as the reſt of this genus) is a native of warm countries. It riſes to the height of four or five feet, having a ſingle herbaceous ſtalk, which is rough in ſome parts. The leaves come out on every ſide towards the top, forming a ſort of head; the flowers come out between the leaves, two or three together upon long footſtalks; they are yellow, and ſhaped like thoſe of peas: after the flower is paſt, the germen becomes a flat jointed pod, which, when ripe, parts at the joints, and in each diviſion is lodged a ſingle kidney-ſhaped ſeed. 2. The Americana, ſeldom riſes more than two feet in height. The flowers come out from the leaves on branching footſtalks, five or ſix together; theſe are much leſs than the former, and of a paler yellow colour. The ſeed is lodged in pods like the other. 3. The arborea, grows to the height of ſix or ſeven feet, with a ſingle ſtem; the flowers come out two or three together, of a copper colour, and as large as thoſe of the aſpera. 4. The ſeſban hath woody ſtems, and branches garniſhed with ſmooth leaves. The flowers are ſmall, of a deep yellow colour, and come out on long ſpikes hanging downward. The ſeed is contained in a ſmooth pod not jointed. 5. The pumila, riſes to the height of about three feet; has flowers of a pale yellow colour, which come out ſometimes ſingle, at ther times two or three upon each footſtalk. The ſeeds are contained in a long falcated pod having 13 or 14 diviſions, each of which lodges a ſingle ſeed. 6. The grandiflora, riſes ſix or eight feet high, with a woody ſtem, ſending out branches towards the top, garniſhed with obtuſe leaves. The flowers are large, yellow, and ſucceeded by large pods containing kidney-ſhaped ſeeds.

Culture. Theſe plants are propagated by ſeeds, which ſhould be ſown early in the ſpring, on a hot-bed: and when the plants have ſtrength enough to be removed, they ſhould each be put into a ſeparate pot filled with light earth, and plunged into a hot-bed. As they increaſe in ſize, they muſt be removed into larger pots; but if theſe are too large, the plants will not thrive. They muſt be brought forward early in the year, otherwiſe the ſecond kind will not perfect its ſeed.

ÆSCULAPIUS, in the Heathen mythology, the god of phyſic, was the ſon of Apollo and the nymph Coronis. He was educated by the centaur Chiron, who taught him phyſic; by which means Æſculapius cured the moſt deſperate diſeaſes. But Jupiter, enraged at his reſtoring to life Hippolitus, who had been torn in pieces by his own horſes, killed him with a thunderbolt. According to Cicero, there were three deities of this name: the firſt, the ſon of Apollo, worſhipped in Arcadia, who invented the probe, and bandages for wounds; the ſecond, the brother of Mercury, killed by lightening; and the third, the ſon of Ariſippus and Arſinoe, who firſt taught the art of tooth-drawing and purging. At Epidaurus, Æſculapius's ſtatue was of gold and ivory, with a long beard, his head ſurrounded with rays, holding in one hand a knotty ſtick, and the other entwined with a ſerpent; he was ſeated on a throne of the ſame materials as his ſtatue; and had a dog lying at his feet. The Romans crowned him with laurel, to repreſent his deſcent from Apollo; and the Phaliaſins repreſented him as beardleſs. The cock, the raven, and the goat, were ſacred to this deity. His chief temples were at Pergamus, Smyrna, Trica a city in Ionia, and the iſle of Coos; in all which, votive tablets were hung up, ſhowing the diſeaſes cured by his aſſiſtance. But his moſt famous ſhrine was at Epidaurus; where, every five years, games were inſtituted to him, nine days after the Iſthmian games at Corinth.

ÆSCULUS, the HORSE-CHESTNUT: A genus of the monogynia order, belonging to the heptandria claſs of plants; and ranking, in the natural method, under the 39th order, *Trihilatæ*.—The characters are: The *calyx* is a ſmall, ſingle-leaved, bellied perianthium, divided into five ſegments. The *corolla* (except in the *pavia*, where it is four-petal'd and cloſe) conſiſts of five roundiſh, flat, expanding petals, unequally coloured, and with narrow claws inſerted into the calyx. The *ſtamina* have ſeven ſubulated declining filaments, the length of the corolla; the antheræ aſcending. The *piſtillum* is a roundiſh germen, ending in a ſubulated ſtylus; the ſtigma pointed. The *pericarpium* is a leathery, roundiſh, trilocular, three-valved capſule. The *ſeeds* are two, and ſubglobular.—In this genus Van Rozen and Miller obſerve both male and hermaphrodite flowers. There are two

Species. 1. The hippocaſtanum, or common horſe-cheſtnut. It was brought from the northern parts of Aſia about the year 1550, and ſent to Vienna about 1588. This tree makes a noble appearance all the month of May, the extremities of the branches being terminated by fine ſpikes of flowers ſpotted with roſe colours, ſo that the whole tree ſeems covered with them. It is quick in its growth; ſo that in a few years it arrives at a ſize large enough to afford a good ſhade in ſummer, as alſo to produce plenty of flowers. They have, however, this great inconvenience, that their wood is of no uſe, being unfit even for burning; and their leaves beginning to fall in July, ſoon deprive the trees of their beauty. There is ſomething very ſingular in the growth of theſe trees; which is, that the whole ſhoot is performed in leſs than three weeks after the buds are opened.—The nuts are reckoned good food for horſes. In Turkey, they are ground, and mixed with the provender of theſe animals, eſpecially thoſe which are troubled with coughs or broken-winded. Deer are alſo very fond of the fruit; and at the time of their ripening keep much about the trees, but eſpecially in ſtrong winds, when the nuts are blown down, which they carefully watch, and greedily devour as they fall.

2. The pavia, or ſcarlet-flowering horſe-cheſnut, a native of Carolina, the Braſils, and the Eaſt. It grows to about fifteen or ſixteen feet high; and there is a delicacy in this tree that makes it deſirable. The bark of the young ſhoots is quite ſmooth, and the growing ſhoots in ſummer are of a reddiſh hue. The leaves are palmated, being pretty much like thoſe of the horſe-cheſnut, only much ſmaller, and the indentures at the edges are deeper and more acute. The lobes of which they are compoſed are ſpear-ſhaped; they are five in number, are united at their baſe, and ſtand on a long red footſtalk. The leaves grow oppoſite by pairs on the branches, which are ſpread abroad on every ſide. The flowers come out from the ends of the branches. The firſt appearance of the buds is in May; though they will not be in full blow till the middle of June. They are of a bright red colour, and conſequently have a pleaſing effect among the vaſt tribe of yellow-flowering ſorts which ſhow themſelves in bloom at that ſeaſon. They continue in ſucceſſion for upwards of ſix weeks; and ſometimes are ſucceeded by ripe ſeeds in our gardens.

Propagation and culture. The firſt ſpecies is propagated from the nuts. In autumn, therefore, when they fall, a ſufficient quantity ſhould be gathered. Theſe ſhould be ſown ſoon afterwards in drills, about two inches aſunder. If the nuts are kept till ſpring, many of them will be faulty; but where the ſeminary-ground cannot be got ready before, and they are kept ſo long, it may be proper to put them in water, to try their goodneſs. The good nuts will ſink, whilſt thoſe which are faulty will ſwim; ſo that by proving them this way you may be ſure of good nuts, and have more promiſing hopes of a crop. In the ſpring the plants will come up; and when they have ſtood one year, they may be taken up, their tap-roots ſhortened, and afterwards planted in the nurſery. When they are of ſufficient ſize to be planted out finally, they muſt be taken out of the nurſery with care, the great ſide-ſhoots and the bruiſed parts of the roots ſhould be taken off, and then planted in large holes level with the ſurface of the ground, at the top of their roots; the fibres being all ſpread and lapped in the fine mould, and the turf alſo worked to the bottom. A ſtake ſhould be placed to keep them ſafe from the winds; and they muſt be fenced from the cattle till they are of a ſufficient ſize to defend themſelves. The beſt ſeaſon for all this work is October. After the trees are planted, neither knife nor hatchet ſhould come near them; but they ſhould be left to Nature to form their beautiful parabolic heads, and aſſume their utmoſt beauty.—The horſe-cheſnut, like moſt other trees, delights moſt in good fat land; but it will grow exceedingly well on clayey and marley grounds.

Miller ſays, “When theſe trees are tranſplanted, their roots ſhould be preſerved as entire as poſſible, for they do not ſucceed well when torn or cut; nor ſhould any of the branches be ſhortened, for there is ſcarce any tree that will not bear amputation better than this; ſo that when any branches are by accident broken, they ſhould be cut off cloſe by the ſtem, that the wound may heal over.”

The ſecond ſpecies is propagated, 1. By budding it upon the young plants of the horſe-cheſnut. Theſe ſtocks ſhould be raiſed as was directed in that article. They ſhould be planted in the nurſery way, one foot aſunder, and two feet diſtant in the rows, which ſhould be kept clean of weeds, and muſt be dug between every winter till the operation is to be performed. After they have ſtood in the nurſery-ground about two years, and have made at leaſt one good ſummer's ſhoot, the ſummer following is the time for the operation. Then, having your cuttings ready ſoon after midſummer, the evenings and cloudy weather ſhould be made choice of for the work. Whoever has a great number of trees to inoculate, muſt regard no weather, but keep working on, to get his buſineſs over before the ſeaſon ends; and, indeed, a good hand will be always pretty ſure of ſucceſs be the weather what it will. If the ſtocks were healthy, the ſummer following they will make pretty good ſhoots; and in a year or two after that will flower. This is one method of propagating this tree; and thoſe plants that are propagated this way will grow to a larger ſize than thoſe raiſed immediately from ſeeds.—2. This tree alſo may be propagated by ſeeds; which will ſometimes ripen with us, and may be obtained out of our own gardens. The manner of raiſing them this way is as follows: Let a warm border be prepared; and if it is not naturally ſandy, let drift-ſand be mixed with the ſoil; and in this border let the ſeeds be ſown in the month of March, about half an inch deep. After this, conſtant weeding muſt be obſerved; and when the plants are come up, if they could be ſhaded in the heat of the day, it would be much better. Theſe, with now and then a gentle watering in a dry ſeaſon, will be all the precautions they will require the firſt ſummer. The winter following if the ſituation is not extremely well-ſheltered, protection muſt be given them from the hard black froſts, which will otherwiſe often deſtroy them; ſo that it will be the ſafeſt way to have the bed hooped, to cover them with mats in ſuch weather, if the ſituation is not well defended: if it is, this trouble may be ſaved; for, even when young, they are tolerably hardy. In about two or three years they may be removed into the nurſery, or planted where they are to remain, and they will flower in three or four years after. The uſual nurſery-care muſt be taken of them when planted in that way; and the beſt time for planting them there, or where they are to remain, is October; though they will grow exceeding well if removed in any of the winter months; but, if planted late in the ſpring, they will require more watering, as the ground will not be ſo regularly ſettled to the roots as if they had been planted earlier.

ÆSOP, the Phrygian, lived in the time of Solon, about the 50th Olympiad, under the reign of Crœſus the laſt king of Lydia. As to genius and abilities, he was greatly indebted to nature; but in other reſpects not ſo fortunate, being born a ſlave and extremely deformed. St Jerome, ſpeaking of him, ſays he was unfortunate in his birth, condition in life, and death; hinting thereby at his deformity, ſervile ſtate, and tragical end. His great genius, however, enabled him to ſupport his misfortunes; and, in order to alleviate the hardſhips of ſervitude, he compoſed thoſe entertaining and inſtructive fables which have acquired him ſo much reputation. He is generally ſuppoſed to have been the inventor of that kind of writing; but this is conteſted by ſeveral, particularly Quintilian, who ſeems to think that Heſiod was the firſt author of fables. Æſop, however, certainly improved this art to a very great degree; and hence it is that he has been accounted the author of this ſort of productions;

> Æſopus auctor quam materiam reperit,
> Hanc ego pollivi verſibus ſenariis.
> *Phæd.* Prol. ad lib. i.
>
> "If any thoughts in theſe iambics ſhine,
> Th' invention's Æſop's, and the verſe is mine."

The firſt maſter whom Æſop ſerved, was one Caraſius Demarchus, an inhabitant of Athens; and there in all probability he acquired his purity in the Greek tongue. After him he had ſeveral maſters, and at length came under a philoſopher named Idmon or Iadmon, who enfranchiſed him. After he had recovered his liberty, he ſoon acquired a great reputation amongſt the Greeks; ſo that, according to Meziriac, the report of his wiſdom having reached Crœſus, he ſent to enquire after him, and engaged him in his ſervice. He travelled through Greece, according to the ſame author; whether for his own pleaſure, or upon the affairs of Crœſus, is uncertain: and paſſing by Athens ſoon after Piſiſtratus had uſurped the ſovereign power, and finding that the Athenians bore the yoke very impatiently, he told them the fable of the frogs who petitioned Jupiter for a king. The images made uſe of by Æſop are certainly very happy inventions to inſtruct mankind; they poſſeſs all that is neceſſary to perfect a precept, having a mixture of the uſeful with the agreeable. "Æſop the fabuliſt (ſays Aulus Gellius), was deſervedly eſteemed wiſe, ſince he did not, after the manner of the philoſophers, rigidly and imperiouſly dictate ſuch things as were proper to be adviſed and perſuaded; but, framing entertaining and agreeable apologues, he thereby charms and captivates the human mind."—Æſop was put to death at Delphi. Plutarch tells us, that he came there with a great quantity of gold and ſilver, being ordered by Crœſus to offer a ſacrifice to Apollo, and to give a conſiderable ſum to each inhabitant: but a quarrel ariſing betwixt him and the Delphians, he ſent back the money to Crœſus; for he thought thoſe for whom that prince deſigned it, had rendered themſelves unworthy of it. The inhabitants of Delphi contrived an accuſation of ſacrilege againſt him; and pretending they had convicted him, threw him headlong from a rock. For this cruelty and injuſtice, we are told they were viſited with famine and peſtilence; and conſulting the oracle, they received for anſwer, that the god deſigned this as a puniſhment for their treatment of Æſop; they endeavoured to make an atonement by raiſing a pyramid to his honour.

ÆSOP (Clodius), a celebrated actor, who flouriſhed about the 670th year of Rome. He and Roſcius were cotemporaries, and the beſt performers who ever appeared upon the Roman ſtage, the former excelling in tragedy, the latter in comedy. Cicero put himſelf under their direction to perfect his action. Æſop lived in a moſt expenſive manner, and at one entertainment is ſaid to have had a diſh which coſt above eight hundred pounds; this diſh, we are told, was filled with ſinging and ſpeaking birds, ſome of which coſt near 50l. The delight which Æſop took in this ſort of birds proceeded, as Mr Bayle obſerves, from the expence. He did not make a diſh of them becauſe they could ſpeak, according to the refinement of Pliny upon this circumſtance, this motive being only by accident; but becauſe of their extraordinary price. If there had been any birds that could not ſpeak, and yet more ſcarce and dear than theſe, he would have procured ſuch for his table. Æſop's ſon was no leſs luxurious than the father; for he diſſolved pearls for his gueſts to ſwallow. Some ſpeak of this as a common practice of his; but others mention his falling into this exceſs only on a particular day, when he was treating his friends. Horace* ſpeaks only of one pearl of great value, which he diſſolved in vinegar, and drank. Æſop, notwithſtanding his expences, is ſaid to have died worth above 160,000l. When he was upon the ſtage, he entered into his part to ſuch a degree, as ſometimes to be ſeized with a perfect ecſtaſy: Plutarch mentions it as reported of him, that whilſt he was repreſenting Atreus deliberating how he ſhould revenge himſelf on Thyeſtes, he was ſo tranſported beyond himſelf in the heat of action, that with his truncheon he ſmote one of the ſervants croſſing the ſtage, and laid him dead on the ſpot.

*Sat. ii. lib. ii. 239.

ÆSTIMATIO capitis, a term met with in old law-books for a fine anciently ordained to be paid for offences committed againſt perſons of quality, according to their ſeveral degrees.

ÆSTIVAL, in a general ſenſe, denotes ſomething connected with, or belonging to, ſummer. Hence æſtival ſign, æſtival ſolſtice, &c.

ÆSTUARIA, in geography, denotes an arm of the ſea, which runs a good way within land. Such is the Cheſapeak bay, &c.

ÆSTUARIES, in ancient baths, were ſecret paſſages from the hypocauſtum into the chambers.

ÆSTUARY, among phyſicians, a vapour-bath, or any other inſtrument for conveying heat to the body.

ÆSYMNIUM, in antiquity, a monument erected to the memory of the heroes, by Æſymnus the Megarean. He conſulting the oracle in what manner the Megareans might be moſt happily governed, was anſwered, *If they held conſultation with the more numerous:* whom he taking for the dead, built the ſaid monument, and a ſenate-houſe that took within its compaſs the monument; imagining that thus the dead would aſſiſt in their conſultations. (Pauſanias.)

ÆETH, or Ath, a ſtrong little town in the Auſtrian Netherlands and province of Hainault, ſituated on the river Dender, about 20 miles S. W. of Bruſſels.

ÆTHALIA, or Ilua (anc. geog.) now *Elba;* an iſland on the coaſt of Etruria, in compaſs an hundred miles, abounding in iron, as Elba ſtlll does. Stephanus calle it *Aethale.* The port of Aethalia was called *Argous*, (Diod Sicul.)

ÆTHELSTAN, ſee ATHELSTAN.

ÆTHER, is uſually underſtood of a thin, ſubtile matter, or medium, much finer and rarer than air; which commencing from the limits of our atmoſphere, poſſeſſes the whole heavenly ſpace.—The word is Greek, αιθηρ, ſuppoſed to be formed from the verb αιθηρ, "to burn, to flame;" ſome of the ancients, particularly Anaxagoras, ſuppoſing it of the nature of fire. See FIRE.

The philoſophers cannot conceive that the largeſt part of the creation ſhould be perfectly void; and therefore they fill it with a ſpecies of matter under the denomination of *æther*. But they vary extremely as to the nature and character of this æther. Some conceive it as a body *ſui generis*, appointed only to fill up the vacuities between the heavenly bodies; and therefore confined to the regions above our atmoſphere. Others ſuppoſe it of ſo ſubtile and penetrating a nature, as to pervade the air, and other bodies, and poſſeſſes the pores and intervals thereof. Others deny the exiſtence of any ſuch ſpecific matter; and think the air itſelf, by that immenſe tenuity and expanſion it is found capable of, may diffuſe itſelf through the interſtellar ſpaces, and be the only matter found therein.

In effect, æther, being no object of our ſenſes, but the mere work of imagination, brought only upon the ſtage for the ſake of hypotheſis, or to ſolve ſome phenomenon, real or imaginary; authors take the liberty to modify it how they pleaſe. Some ſuppoſe it of an elementary nature, like other bodies; and only diſtinguiſhed by its tenuity, and the other affections conſequent thereon: which is the philoſophical æther. Others will have it of another ſpecies, and not elementary; but rather a ſort of fifth element, of a purer, more refined, and ſpirituous nature, than the ſubſtances about our earth: and void of the common affections thereof, as gravity, &c. The heavenly ſpaces being the ſuppoſed region or reſidence of a more exalted claſs of beings, the medium muſt be more exalted in proportion. Such is the ancient and popular idea of æther, or ætherial matter.

The term *æther* being thus embarraſſed with a variety of ideas, and arbitrarily applied to ſo many different things, the later and ſeverer philoſophers chooſe to ſet it aſide, and in lieu thereof to ſubſtitute other more determinate ones. Thus, the Carteſians uſe the term *materia ſubtilis*; which is their æther: and Sir Iſaac Newton, ſometimes a *ſubtile ſpirit*, as in the cloſe of his *Principia*; and ſometimes a *ſubtile* or *ætherial medium*, as in his *Optics*.

The truth is, there are abundance of conſiderations, which ſeem to evince the exiſtence of ſome matter in the air, much finer than the air itſelf. There is an unknown ſomething, which remains behind when the air is taken away; as appears from certain effects which we ſee produced *in vacuo*. Heat, Sir Iſaac Newton obſerves, is communicated through a vacuum almoſt as readily as through air: but ſuch communication cannot be without ſome interjacent body, to act as a medium. And ſuch body may be ſubtile enough to penetrate the pores of glaſs; and may be very well concluded to permeate thoſe of all other bodies, and conſequently be diffuſed through all the parts of ſpace which anſwers to the full character of an æther. See HEAT.

The exiſtence of ſuch an ætherial medium being ſettled, that author proceeds to its properties; inferring it to be not only rarer and more fluid than air, but exceedingly more elaſtic and active: in virtue of which properties, he ſhows, that a great part of the phenomena of nature may be produced by it. To the weight, *e.g.* of this medium, he attributes gravitation, or the weight of all other bodies; and to its elaſticity, the elaſtic force of the air and of nervous fibres, and the emiſſion, refraction, reflection, and other phenomena of light; as alſo, ſenſation, muſcular motion, &c. In fine, this ſame matter ſeems the *primum mobile*, the firſt ſource or ſpring of phyſical action in the modern ſyſtem.

The Carteſian æther is ſuppoſed not only to pervade, but adequately to fill, all the vacuities of bodies; and thus to make an abſolute plenum in the univerſe.

But Sir Iſaac Newton overturns this opinion, from divers conſiderations; by ſhowing, that the celeſtial ſpaces are void of all ſenſible reſiſtance: for, hence it follows, that the matter contained therein muſt be immenſely rare, in regard the reſiſtance of bodies is chiefly as their denſity; ſo that if the heavens were thus adequately filled with a medium or matter, how ſubtile ſoever, they would reſiſt the motion of the planets and comets much more than quickſilver or gold.

The late diſcoveries in electricity have thrown great light upon this ſubject, and render it extremely probable that the æther ſo often talked of is no other than the electric fluid, or ſolar light, which diffuſes itſelf throughout the whole ſyſtem of nature. See ELECTRICITY, FIRE, HEAT, LIGHT, &c.

ÆTHER, in chemiſtry, the lighteſt, moſt volatile, and moſt inflammable of all liquids, is produced by diſtillation of acids with rectified ſpirit of wine. See CHEMISTRY and PHARMACY (the *Indexes*).

ÆTHERIAL, ETHERIUS, ſomething that belongs to, or partakes of, the nature of ÆTHER. Thus we ſay, the *ætherial ſpace*, *ætherial regions*, &c.

Some of the ancients divided the univerſe, with reſpect to the matter contained therein, into elementary and ætherial.

Under the ætherial world was included all that ſpace above the uppermoſt element, viz. fire. This they ſuppoſed to be perfectly homogeneous, incorruptible, unchangeable, &c. See CORRUPTION. The Chaldees placed an ætherial world between the empyreum and the region of the fixed ſtars. Beſides which, they ſometimes alſo ſpeak of a ſecond ætherial world, meaning by it the ſtarry orb; and a third ætherial world, by which is meant the the planetary region.

ÆTHIOPIA. See ETHIOPIA.

ÆTHIOPS, *Mineral*, *Martial*, and *Antimonial*. See PHARMACY (*Index*).

ÆTHUSA, in botany, a genus of the pentandria digynia claſs; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The characters are: The *calyx* is an univerſal umbel expanding, the interior rays ſhorter by degrees; with a partial umbel, ſmall, and expanding. There is no univerſal involucrum; the partial one is dimidiated, with three or five leaflets, and pendulous; the proper perianthium ſcarcely diſcernible. The univerſal *corolla* is uniform with fertile florets; the partial one has five heart-inflected unequal petals. The *ſtamina* conſiſt of five ſimple filaments, with roundiſh antheræ. The *piſtillum* is a germen beneath; with two reflected ſtyli; the ſtigmata obtuſe. There is no *pericarpium;* the fruit is ovate, ſtriated, and tripartite. The *ſeeds* are two, roundiſh and ſtriated. There is but one ſpecies, viz. the æthuſa ſynapium, fools-parſley, or leſſer hemlock (a native of Britain), which grows in corn-fields and gardens. This plant, from its reſemblance to common parſley, hath ſometimes been miſtaken for it; and when eaten, it occaſions ſickneſs. If the curled-leaved parſley only was cultivated in gardens, no ſuch miſtakes would happen in future. Cows, horſes, ſheep, goats, and ſwine, eat it. It is noxious to geeſe.

AETIANS, in church-hiſtory, a branch of Arians who maintained, that the Son and Holy Ghoſt are in all things diſſimilar to the Father. See AETIUS.

ÆTIOLOGY, is that part of Pathology which is employed in exploring the cauſes of diſeaſes.

AETION, a celebrated painter, who has left us an excellent picture of Roxana and Alexander, which he exhibited at the Olympic Games: it repreſents a magnificent chamber, where Roxana is ſitting on a bed of a moſt ſplendid appearance, which is rendered ſtill more brilliant by her beauty. She looks downwards, in a kind of confuſion, being ſtruck with the preſence of Alexander ſtanding before her. A number of little Cupids flutter about, ſome holding up the curtain, as if to ſhow Roxana to the prince, whilſt others are buſied in undreſſing the lady; ſome pull Alexander by the cloak, who appears like a young baſhful bridegroom, and preſent him to his miſtreſs: he lays his crown at her feet, being accompanied by Epheſtion, who holds a torch in his hand, and leans upon a youth, who repreſents Hymen. Several other little Cupids are repreſented playing with his arms; ſome carry his lance, ſtooping under ſo heavy a weight; others bear along his buckler, upon which one of them is ſeated, whom the reſt carry in triumph; another lies in ambuſh in his armour, waiting to frighten the reſt as they paſs by. This picture gained Aetion ſo much reputation, that the preſident of the games gave him his daughter in marriage.

ÆTITES, or EAGLE-STONE, in natural hiſtory, a flinty or cruſtated ſtone, hollow within, and containing a *nucleus*, which, on ſhaking, rattles within. It was formerly in repute for ſeveral extraordinary magical as well as medical powers; ſuch as preventing abortion, diſcovering thieves, and other ridiculous properties. The word is formed from αετος, "eagle;" the popular tradition being, that it is found in the eagle's neſt, whither it is ſuppoſed to be carried while the female ſits, to prevent her eggs from being rotten. It is found in ſeveral parts, near Trevoux in France, one can ſcarce dig a few feet, without finding conſiderable ſtrata or beds of the coarſer or ferruginous kind. They are originally ſoft, and of the colour of yellow ochre. But the fineſt and moſt valued of all the eagle-ſtones, are accidental ſtates of one or other of our common pebbles.

AETIUS, one of the moſt zealous defenders of Arianiſm, was born in Syria, and flouriſhed about the year 336. After being ſervant to a grammarian, of whom he learned grammar and logic, he was ordained deacon, and at length biſhop, by Eudoxus patriarch of Conſtantinople. St Epiphanius has preſerved 47 of his propoſitions againſt the Trinity. His followers were called AETIANS.

AETIUS, a famous phyſician, born at Amida in Meſopotamia, and the author of a work intitled *Tetrabiblos*, which is a collection from the writings of thoſe phyſicians who went before him. He lived, according to Dr Friend, at the end of the 5th or the beginning of the 6th century.

AETIUS, governor of Gallia Narbonenſis in the reign of Valentinian III. forced the Franks who were paſſing into Gaul to repaſs the Rhine. He defeated the Goths; and routed Attila king of the Huns, who invaded Gaul with an army of 700,000 men. But the emperor, jealous of the merit of this great man, killed him in 454 with his own hand, under the pretence that he had permitted the invaſion of the Huns, after Attila's defeat.

ÆTNA, (in the Itineraries *Æthna*, ſuppoſed from αιθω, "to burn"; according to Bochart, from *Athuna*, a furnace, or *Ætuna*, darkneſs), now *Monte Gibello:* a vulcano or burning mountain of Sicily, ſituated in lat. 38°. N. long. 15°. E.

This mountain, famous from the remoteſt antiquity, both for its bulk and terrible eruptions, ſtands in the eaſtern part of the iſland, in a very extenſive plain, called *Val Demoni*, from the notion of its being inhabited by devils, who torment the ſpirits of the damned in the bowels of this vulcano.

Inconſiſtent accounts concerning the magnitude of Ætna.

Concerning the dimenſions of mount Ætna, we can ſcarce extract any thing conſiſtent, even from the accounts of the lateſt and moſt ingenious travellers. Pindar, who lived about 435 years before Chriſt, calls it the *Pillar of heaven*, on account of its great height. All modern writers likewiſe agree, that this mountain is very high, and very large; but differ exceſſively both as to its height and magnitude: ſome making it no leſs than twelve miles high, others eight, others ſix, ſome four, while Mr Brydone, and Sir William Hamilton, who lately aſcended to its higheſt ſummit, reduce its height to little more than two miles; nay, by ſome it is reduced to 10,036 feet, ſomewhat leſs than two miles. No leſs remarkable are the differences concerning its circumference: ſome making it only 60 miles round, others 100; and Signior Recupero, from whom Mr Brydone had his information in this reſpect, affirms it to be no leſs than 183 miles in circuit.

We are ſorry to detract from the merit of Mr Brydone, or to involve in obſcurity what he hath been at ſo much pains to elucidate; but every perſon who compares the account of mount Ætna's circumference, given by Signior Recupero, and to which Mr Brydone ſeems to have aſſented, with its apparent circumference on the map prefixed to that gentleman's tour through Sicily and Malta, muſt at once be ſtruck with the prodigious diſparity. Indeed, it is plain, that, in the map, the geographer hath not left room for any ſuch mountain; nor can we help thinking, that, by comparing the diſtances of ſome of the Sicilian towns from one another, Signior Recupero's dimenſions will be found enormouſly exaggerated.—Certain it is, that there the geographer hath placed Catania, which ſtands at the foot of mount Ætna, on one ſide, no more than 28 miles from the moſt diſtant point of the river Alcantara, which forms the boundary on the oppoſite ſide ; ſo that a circle, whoſe radius is 14 or 15 miles, muſt encompaſs as much ſpace as we can poſſibly think is occupied by the baſis of mount Ætna. Thus we will reduce the circumference of this famous mountain to between 80 and 90 miles ; and even when we do ſo, it muſt ſtill be acknowledged to be very great.

Dimenſions uncertain.

But if we are embarraſſed with the circumference of Ætna, we are much more ſo with the accounts relating to its height ; and one circumſtance, particularly, creates almoſt inſurmountable difficulties. It is agreed upon by all travellers, and among the reſt by Sir William Hamilton, that from Catania, where the aſcent firſt begins, to the ſummit, is no leſs than 30 miles. The deſcent on the other ſide we have no account of ; but, whatever ſuppoſition we make, the height of the mountain muſt be prodigious. If we ſuppoſe it likewiſe to be 30 miles, and that mount Ætna can be repreſented by an equilateral triangle, each of whoſe ſides is 30 miles, we will have an amazing elevation indeed, no leſs than 26 miles perpendicular !—Such a height being beyond all credibility, we muſt contract the ſides of our triangle, in proportion to its baſis. We ſhall begin with allowing 10 miles for the difference between a ſtraight line from Catania to the ſummit, and the length of the road, occaſioned by the inequalities of the mountain ; and ſuppoſing the deſcent on the other ſide to be ſomewhat ſhorter, we may call it 15 miles. Mount Ætna will now be repreſented by a ſcalene triangle, whoſe baſe is 30 miles, its longeſt ſide 20, and its ſhorteſt 15 ; from which proportions we will ſtill find its height to be betwixt eight and nine miles.—This is ſtill incredible ; and when all the various relations concerning the height of Ætna are compared, we hope it will not be thought preſumptuous in us to give it as our opinion, that the true dimenſions of this mountain are as yet unknown. The following meaſures are given by different authors :

Height above the ſurface of the ſea, 10,036 feet.

One hundred and eighty miles circumference at the baſe.—Faujas de S. Fon in his Volcans du Vivarais.

Height 12,000 feet.—Brydone. Tour to Sicily.

Height 2500 toiſes.—La Platrière, ſaid as from Recupero.

Height 1950 toiſes.—Diameter 30 miles.—Mentelle Geogr. comp.

Others make its height only 2000 toiſes, and its ſuperficies 300 ſquare miles.

General appearance, &c.

Concerning the products and general appearance of this volcano, authors are much better agreed.—The journey from Catania to its ſummit has been lately deſcribed by three travellers, M. D'Orville, Mr Brydone, and Sir William Hamilton. All theſe agree, that this ſingle mountain affords an epitome of the different climates throughout the whole world : towards the foot, it is very hot ; farther up, more temperate ; and grows gradually more and more cold the higher we aſcend. At the very top, it is perpetually covered with ſnow : from thence the whole iſland is ſupplied with that article, ſo neceſſary in a hot climate, and without which the natives ſay Sicily could not be inhabited. So great is the demand for this commodity, that the biſhop's revenues, which are conſiderable, ariſe from the ſale of mount Ætna's ſnow ; and he is ſaid to draw 1000*l.* a-year from one ſmall portion lying on the north ſide of the mountain. Great quantities of ſnow and ice are likewiſe exported to Malta and Italy, making a conſiderable branch of commerce. On the north ſide of this ſnowy region, Mr Brydone was aſſured, that there are ſeveral ſmall lakes which never thaw ; and that the ſnow mixed with the aſhes and ſalt of the mountain are accumulated to a vaſt depth. The quantity of ſalts contained in this mountain, he, with great probability, conjectures to be one reaſon of the preſervation of its ſnows ; for ſalt increaſes the coldneſs of ſnow to a ſurpriſing degree*.

Crater deſcribed.

In the middle of the ſnowy regions ſtands the great *crater*, or mouth of Ætna ; from which, though contrary to the uſual method of travellers, we ſhall begin our particular account of this mountain. Sir William Hamilton deſcribes the crater as a little mountain, about a quarter of a mile perpendicular, and very ſteep, ſituated in the middle of a gently inclining plain, of about nine miles in circumference. It is entirely formed of ſtones and aſhes ; and, as Mr Hamilton was informed by ſeveral people of Catania, had been thrown up about 25 or 30 years before the time (1769) he viſited mount Ætna. Before this mountain was thrown up, there was only a prodigious large chaſm, or gulph, in the middle of the above-mentioned plain ; and it has been remarked, that about once in 100 years the top of Ætna falls in ; which undoubtedly muſt be the caſe at certain periods, or the mountain behoved continually to increaſe in height. As this little mountain, though emitting ſmoke from every pore, appeared ſolid and firm, Mr Hamilton and his companions went up to the very top. In the middle is a hollow, about two miles and a half in circumference, according to Mr Hamilton ; three miles and a half, according to Mr Brydone ; and three or four, according to Mr D'Orville. The inſide is cruſted over with ſalts and ſulphur of different colours. It goes ſhelving down, from the top, like an inverted cone ; the depth, in Mr Hamilton's opinion, nearly correſponding to the height of the little mountain. From many places of this ſpace iſſue volumes of ſulphureous ſmoke, which being much heavier than the circumambient air, inſtead of aſcending in it, roll down the ſide of the mountain, till, coming to a more denſe atmoſphere, it ſhoots off horizontally, and forms a large tract in the air, according to the direction of the wind ; which, happily for our travellers, carried it exactly to the ſide oppoſite to which they were placed. In the middle of this funnel is the tremenduous and unfathomable gulph, ſo much celebrated in all ages, both as the terror of this life, and the place of puniſhment in the next. From this gulph continually iſſue terrible and confuſed noiſes, which in eruptions are increaſed to ſuch a degree as to be heard at a prodigious diſtance. Its diameter is probably very different at different times : for Mr Hamilton obſerved, by the wind clearing away the ſmoke from time to time, that the inverted hollow cone was contracted almoſt to a point ; while Mr D'Orville and Mr Brydone found the opening very large. Both Mr Brydone and Mr Hamilton found the crater too hot to deſcend into it ; but Mr D'Orville was bolder ; and accordingly he and his fellow-traveller, faſtened to ropes which two or three men held at a diſtance for fear of accidents, deſcended as near as poſſible to the brink of the gulph ; but the ſmall flames and ſmoke which iſſued from it on every ſide, and a greeniſh ſulphur, and pumice-ſtones, quite black, which covered the margin, would not permit them to come ſo near

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* See *Cold*, and *Congelation*.

Ætna.

as to have a full view. They only ſaw diſtinctly in the middle, a maſs of matter which roſe, in the ſhape of a cone, to the height of above 60 feet, and which towards the baſe, as far as their ſight could reach, might be 600 or 800. while they were obſerving this ſubſtance ſome motion was perceived on the north ſide, oppoſite to that whereon they ſtood; and immediately the mountain began to ſend forth ſmoke and aſhes. This eruption was preceded by a ſenſible increaſe of its internal roarings; which, however, did not continue; but after a moment's dilatation, as if to give it vent, the volcano reſumed its former tranquillity; but as it was by no means proper to make a longer ſtay in ſuch a place, our travellers immediately returned to their attendants.

On the ſummit of mount Ætna, Mr Hamilton obſerves, that he was ſenſible of a difficulty in reſpiration from the too great ſubtility of the air, independent of what aroſe from the ſulphureous ſmoke of the mountain. Mr Brydone takes no notice of this; which probably aroſe from the air being in a more rarefied ſtate at the time of Mr Hamilton's obſervations than of Mr Brydone's; the barometer as obſerved by the former, ſtanding at 18 inches and 10 lines, by the latter at 19 inches 6½ lines.

In theſe high regions there is generally a very violent wind, which, as all our travellers found it conſtantly blowing from the ſouth, may poſſibly be commonly directed from that point. Here Mr Brydone's thermometer fell to 27°.

Splendor of the ſtars ſeen from the top of Ætna.

The top of Ætna being above the common region of vapours, the heavens appear with exceeding great ſplendor.—Mr Brydone and his company obſerved, as they aſcended in the night, that the number of ſtars ſeemed to be infinitely increaſed, and the light of each of them appeared brighter than uſual; the whiteneſs of the milky-way was like a pure flame which ſhot acroſs the heavens; and with the naked eye, they could obſerve cluſters of ſtars that were inviſible from below. Had Jupiter been viſible, he is of opinion that ſome of his ſattellites might have been diſcovered with the naked eye, or at leaſt with a very ſmall pocket-glaſs. He likewiſe took notice of ſeveral of thoſe meteors called *falling ſtars*; which appeared as much elevated as when viewed from the plain: a proof, according to Mr Brydone, that "theſe bodies move in regions much beyond the bounds that ſome philoſophers have aſſigned to our atmoſphere."

Extenſive proſpect.

To have a full and clear proſpect from the ſummit of mount Ætna, it is neceſſary to be there before ſunriſe; as the vapours raiſed by the ſun, in the day-time, will obſcure every object: accordingly, our travellers took care to arrive there early enough; and all agree, that the beauty of the proſpect from thence cannot be expreſſed.—Here Mr Brydone and Mr Hamilton had a view of Calabria in Italy, with the ſea beyond it; the Lipari iſlands, and Stromboli, a volcano at about 70 miles diſtance, appeared juſt under their feet; the whole iſland of Sicily, with its rivers, towns, harbours, &c. appeared diſtinct, as if ſeen on a map. Maſſa, a Sicilian author, affirms, that the African coaſt, as well as that of Naples, with many of its iſlands, have been diſcovered from the top of Ætna. The viſible horizon here is not leſs than 8 or 900 miles in diameter. The pyramidal ſhadow of the mountain reaches acroſs the whole iſland, and far into the ſea on the other ſide, forming a viſible tract in the air, which, as the ſun riſes above the horizon, is ſhortened, and at laſt confined to the neighbourhood of Ætna. The moſt beautiful part of the ſcene, however, in Mr Brydone's opinion, is the mountain itſelf, the iſland of Sicily, and the numerous iſlands lying round it. Theſe laſt ſeem to be cloſe to the ſkirts of Ætna; the diſtances appearing reduced to nothing.

Diviſion into three zones.

This mountain is divided into three zones, which might properly enough be diſtinguiſhed by the names of *torrid*, *temperate*, and *frigid*: they are, however, known by the names of the *Piedmonteſe*, or *Regione culta*, the cultivated, or fertile region; the *Sylvoſa*, woody, or temperate zone; and the *Regione deſerta*, the frigid, or deſert zone, or region. All theſe are plainly diſtinguiſhed from the ſummit. The *Regione deſerta* is marked out by a circle of ſnow and ice, which extends on all ſides to the diſtance of about eight miles, beginning at the foot of the crater. Greateſt part of this region is ſmooth and even. This is immediately ſucceeded by the *Sylvoſa*, or woody region; which forms a circle of the moſt beautiful green, ſurrounding the mountain on all ſides. This region is variegated with a vaſt number of mountains of a conical form, thrown up by Ætna in thoſe eruptions which burſt out from its ſides. Mr Hamilton counted 44 on the Catania ſide, each having its crater, many with large trees flouriſhing both within and without the craters. All theſe, except a few of late date, have acquired a wonderful degree of fertility. The circumference of this zone, or great circle, according to Recupero, is not leſs than 70 or 80 miles. It is everywhere ſucceeded by the *Regione culta*; which is much broader than the reſt, and extends on all ſides to the foot of the mountain. Here terrible devaſtations are ſometimes committed by the eruptions; and the whole region is likewiſe full of conical mountains thrown up by them. The circumference of this region, is, by Recupero, reckoned 183 miles; but we have already given our reaſons for rejecting theſe dimenſions.—This region is bounded by the ſea to the ſouth and ſouth-eaſt; and on all other ſides, by the river Semetus and Alcantara, which form the boundaries of mount Ætna.

Regione deſerta.

Il Torre del Filoſofo.

About a mile below the foot of the great crater, are found the ruins of an ancient ſtructure, called *Il Torre del Filoſofo*, by ſome ſuppoſed to have been built by the philoſopher Empedocles, who took up his habitation here, the better to ſtudy the nature of Mount Ætna. By others they are ſuppoſed to be ruins of a temple of Vulcan. They are of brick, and ſeem to have been ornamented with marble. Somewhere in this region alſo, Mr D'Orville found a great oblong block of poliſhed marble, eight or ten feet high, and three or four thick; though how it came there, was quite unaccountable to him. From Mr D'Orville's and Mr Brydone's accounts, we muſt reckon this part of the mountain pretty ſteep: but Mr Hamilton ſays, that the aſcent was ſo gradual, as not to be in the leaſt fatiguing; and had it not been for the ſnows, they might have rode on their mules to the very foot of the crater.

Regione Sylvoſa.

The woody region deſcends eight or nine miles below the *Regione deſerta*, but differs greatly in the temperature of its climate. Mr Hamilton obſerved a gradual decreaſe of the vegetation as he advanced; the under part being covered with large timber trees, which grew gradually leſs as he approached the third region, at laſt they degenerated into the ſmall plants of the northern climates. He alſo obſerved quantities of juniper and tanſey ; and was informed by his guide, that later in the ſeaſon (he viſited Ætna in June 1769) there are a great many curious plants, and in ſome places rhubarb and ſaffron in great plenty. In Carrera's hiſtory of Catania, there is a liſt of all the plants and herbs of Ætna in alphabetical order.

This region is extolled by Mr Brydone as one of the moſt delightful ſpots on earth. He lodged for a night in a large cave near the middle, formed by one of the moſt ancient lavas. It is called *La Spelonca del Capriole*, or the goats cavern ; becauſe it is frequented by thoſe animals, which take refuge there in bad weather. Here his reſt was diſturbed by a mountain thrown up in the eruption 1766. It diſcharged great quantities of ſmoke, and made ſeveral exploſions like heavy cannon fired at a diſtance ; but they could obſerve no appearance of fire.

Eruption of boiling water.

This gentleman likewiſe viſited the eaſtern ſide of the *Regione ſylvoſa*, intending to have aſcended that way to the ſummit, and deſcended again on the ſouth ſide to Catania ; but found it impracticable ; though what the inſurmountable difficulties were, he does not mention. On this ſide, part of the woody region was deſtroyed, in 1755, by an immenſe torrent of boiling water, which iſſued from the great crater. Its traces were ſtill very viſible, about a mile and an half broad, and in ſome places more. The ſoil was then only beginning to recover its vegetative power, which it ſeems this torrent had deſtroyed for 14 years.—Near this place are ſome beautiful woods of cork, and evergreen oak, growing abſolutely out of the lava, the ſoil having hardly filled the crevices ; and not far off, our traveller obſerved ſeven little mountains that ſeemed to have been formed by a late eruption. Each of theſe had a regular cup, or crater, on the top ; and, in ſome, the middle gulph, or, *Voraginæ*, as the Sicilians call it, was ſtill open. Into theſe gulphs Mr Brydone tumbled down ſtones, and heard the noiſe for a long time after. All the fields round, to a conſiderable diſtance, were covered with large burnt ſtones diſcharged from theſe little vulcanoes.

Overgrown cheſtnut-trees.

The woody region, eſpecially the eaſt ſide, called *Carpinetto*, abounds with very large cheſtnut trees ; the moſt remarkable of which has been called, from its ſize, *Caſtagno de Cento Cavalli*, or cheſtnut-tree of an hundred horſe. Mr Brydone was greatly diſappointed at the ſight of this tree, as it is only a buſh of five large ones growing together : but his guides aſſured him that all theſe five were once united into one ſtem ; and Signior Recupero told him, that he himſelf had been at the expence of carrying up peaſants with tools to dig round this buſh of trees, and found all the ſtems united below ground in one root. The circumference, as meaſured by Meſſrs Brydone and Glover, who accompanied him, amounted to 204 feet. Another of theſe, about a mile and a half higher on the mountain, is called *Caſtagna del Galea* : it riſes from one ſolid ſtem to a conſiderable height ; after which it branches out, and is a much finer object than the other : this was meaſured two feet above the ground, and found to be 76 feet in circumference. A third, called *Caſtagna del Nave*, is pretty nearly of the ſame ſize ; and Maſſa, one of the moſt eſteemed Sicilian authors, affirms that he has ſeen ſolid oaks there upwards of 40 feet round. All theſe grow on a thick rich ſoil, which ſeems originally to have been formed of aſhes thrown out by the mountain. Here the barometer ſtood at 26 inches 5 lines and an half, indicating an elevation of near 4000 feet.

Regione Culta.

Subterraneous caverns.

The Piedmonteſe diſtrict is covered with towns, villages, monaſteries, &c. and is well peopled, notwithſtanding the danger of ſuch a ſituation ; but the fertility of the ſoil tempts people to inhabit that country ; and their ſuperſtitious confidence in their ſaints, with the propenſity mankind have to deſpiſe danger which they do not ſee, render them as ſecure there as in any other place. Here, Sir William Hamilton obſerves, they keep their vines low, contrary to the cuſtom of thoſe who inhabit mount Veſuvius ; and they produce a ſtronger wine, but not in ſuch abundance : here alſo many terrible eruptions have burſt forth ; particularly one in 1669. At the foot of the mountain raiſed by that eruption, is a hole, through which Sir William Hamilton deſcended, by means of a rope, into ſeveral ſubterraneous caverns, branching out, and extending much farther than he choſe to venture, the cold there being exceſſive, and a violent wind extinguiſhing ſome of the torches. Many other caverns are known in this and the other regions of Ætna ; particularly one near this place called *La Spalonca della Palomba*, (from the wild pigeons building their neſts there). Here Mr Brydone was told that ſome people had loſt their ſenſes, from having advanced too far, imagining they ſaw devils and damned ſpirits.—Some of theſe caverns are made uſe of as magazines for ſnow ; which they are well adapted for, on account of their extreme cold. Theſe are with great probability ſuppoſed by Sir William Hamilton to be the hollows made by the iſſuing of the lava in eruptions.

River Acis.

In this region the river *Acis*, ſo much celebrated by the poets, in the fable of Acis and Galatea, takes its riſe. It burſts out of the earth at once in a large ſtream, runs with great rapidity, and about a mile from its ſource throws itſelf into the ſea. Its water is remarkably clear, and ſo extremely cold, that it is reckoned dangerous to drink it : it is ſaid, however, to have a poiſonous quality, from being impregnated with vitriol ; in conſequence of which cattle have been killed by it. It never freezes, but is ſaid often to contract a greater degree of cold than ice.

Appearances during an eruption

Having thus given an account of this mountain in its quiet and peaceable ſtate, we muſt now deſcribe the appearance it puts on during the time of an eruption, when it ſpreads deſtruction for many miles round, and is capable of ſtriking the boldeſt with terror.

Sir William Hamilton, who has examined both Veſuvius and Ætna in a very accurate manner, never had an opportunity of ſeeing an eruption of the latter ; but as he is of opinion that the two volcanoes agree perfectly in all reſpects, only that the latter is on a much larger ſcale than the former, we hope it will not be unacceptable to our readers to give an account of ſome of the general appearances of Veſuvius when in a ſtate of eruption, the better to help their ideas concerning Ætna.

It has been already obſerved, that a ſmoke conſtantly iſſues from the top of Ætna, and that its internal noiſes never ceaſe. The caſe is the ſame with Veſuvius :

vius: and Sir William Hamilton obſerved, that in bad weather the ſmoke was more conſiderable, as well as the noiſe much louder, than when it was fair; ſo that in bad weather he had frequently heard the inward exploſions of the mountain at Naples ſix miles diſtant from Veſuvius. He alſo obſerved the ſmoke that iſſued from the mountain in bad weather to be very white, moiſt, and not near ſo offenſive as the ſulphureous ſteams from various cracks in the ſide of the mountain.

Signs of an approaching eruption.

Hamilton's Obſervations, p. 4.

The firſt ſymptom of an approaching eruption is an increaſe of the ſmoke in fair weather: after ſome time, a puff of black ſmoke is frequently ſeen to ſhoot up in the midſt of the white, to a conſiderable height. Theſe puffs are attended with conſiderable exploſions: for while Veſuvius was in this ſtate, Sir William Hamilton went up to its top, which was covered with ſnow; and perceiving a little hillock of ſulphur, about ſix feet high, which had been lately thrown up, and burnt with a blue flame at the top, he was examining this phenomenon, when ſuddenly a violent report was heard, a column of black ſmoke ſhot up with violence, and was followed by a reddiſh flame. Immediately a ſhower of ſtones fell; upon which he thought proper to retire. Phenomena of this kind, in all probability, precede the eruptions of Ætna in a much greater degree.—The ſmoke at length appears wholly black in the day-time, and in the night has the appearance of flame; ſhowers of aſhes are ſent forth, earthquakes are produced, the mountain diſcharges volleys of red-hot ſtones to a great height in the air. The force by which theſe ſtones are projected, as well as their magnitudes, ſeems to be in proportion to the bulk of the mountain. Signior Recupero aſſured Mr Brydone, that he had ſeen immenſely large ones thrown perpendicularly upwards to the height of 7000 feet, as he calculated from the time they took to arrive at the earth after beginning to deſcend from their greateſt elevation. The largeſt ſtone, or rather rock, that was ever known to be emitted by Veſuvius, was 12 feet long and 45 in circumference. This was thrown a quarter of a mile; but much larger ones have been thrown out by mount Ætna, almoſt in the proportion in which the latter exceeds Veſuvius in bulk. Along with theſe terrible ſymptoms, the ſmoke that iſſues from the crater is ſometimes in a highly electrified ſtate. In this caſe, the ſmall aſhes which are continually emitted from the crater, are attracted by the ſmoke, and riſe with it to a great height, forming a vaſt black, and to appearance denſe, column; from this column continual flaſhes of forked or zig-zag lightning iſſue, ſometimes attended with thunder, and ſometimes not, but equally powerful with ordinary lightning. This phenomenon was obſerved by Sir William Hamilton in the ſmoke of Veſuvius, and has alſo been taken notice of in that of Ætna; and where this electrified ſmoke hath ſpread over a tract of land, much miſchief has been done by the lightning proceeding from it.

Thunder & lightning from the ſmoke.

When theſe dreadful appearances have continued ſometimes four or five months, the *lava* begins to make its appearance. This is a ſtream of melted mineral matters, which in Veſuvius commonly boils over the top, but very ſeldom does ſo in Ætna; owing to the great weight of the lava, which long before it can be raiſed to the vaſt height of mount Ætna, burſts out through ſome weak place in its ſide. Upon the appearance of the lava, the violent eruptions of the mountain generally, though not always, ceaſe; for if this burning matter gets not ſufficient vent, the commotion increaſes to a prodigious degree.—In the night-time the lava appears like a ſtream of fire, accompanied with flame: but in the day-time it has no ſuch appearance; its progreſs is marked by a white ſmoke, which by the reflection of the red-hot matter in the night aſſumes the appearance of flame.

Eruption in 1669.

All the abovementioned ſymptoms preceded the great eruption of Ætna in 1669. For ſeveral months before the lava broke forth, the *old mouth*, or great crater on the ſummit, was obſerved to ſend forth great quantities of ſmoke and flame; the top had fallen in, ſo that the mountain was much lowered; the iſlands alſo of Volcan and Stromboli, two volcanoes to the weſtward of Sicily, were obſerved to rage more than uſual.—Eighteen days before the eruption the ſky was very thick and dark, with thunder, lightning, frequent concuſſions of the earth, and dreadful ſubterraneous bellowings. On the 11th of March, ſome time before the lava got vent, a rent was opened in the mountain twelve miles in length, into which, when ſtones were thrown down, they could not be heard to ſtrike the bottom. Burning rocks, 60 palms (15 of our feet) in length, were thrown to the diſtance of a mile; others of a leſſer ſize were carried three miles off; the internal noiſes of the mountain were exceedingly dreadful, and the thunder and lightning from the ſmoke ſcarce leſs terrible than they. When the lava at laſt got vent, it burſt out of a vineyard 20 miles below the great crater, and ſprung up into the air to a conſiderable height. Here it formed a mountain of ſtones and aſhes, not leſs, as Sir Wm. Hamilton conjectures, than half a mile perpendicular in height, and three miles in circumference. For 54 days neither ſun nor ſtars had appeared: but ſoon after the lava got vent, the mountain became very quiet. The terrible effects of this fiery ſtream may be imagined from its amazing extent; being, as Sir Wm. Hamilton obſerves, no leſs than 14 miles long, and in many places ſix in breadth. In its courſe, it deſtroyed the habitations of near 30,000 perſons; and meeting with a lake four miles in compaſs, it not only filled it up, though ſeveral fathom deep, but made a mountain in the place of it. Having reached Catania, it deſtroyed part of its walls, and ran for a conſiderable length into the ſea, forming a ſafe and beautiful harbour; which, however, was ſoon filled up by a freſh torrent of the ſame inflammable matter.

Phenomena at the breaking forth of the lava.

It is not eaſy for thoſe who have never been preſent at thoſe terrible operations of nature, to repreſent to their minds the horror which muſt attend the breaking forth of the lava; for though the giving vent to this burning matter generally produces a ceſſation of the violent efforts of the internal fire, yet at the very inſtant of its exploſion ſcarce any thing can be conceived ſo dreadful. See VESUVIUS.

Hamilton's obſervations, p. 12.

When the lava firſt iſſues, it appears very fluid, and runs with the rapidity of a ſwift river; but even then it ſurpriſingly reſiſts the impreſſion of ſolid bodies: for Sir Wm. Hamilton could not pierce that of Veſuvius with a ſtick driven againſt it with all his force; nor did the largeſt ſtone he was able to throw upon it ſink, but made a ſlight impreſſion, and then floated along. This happened almoſt at the very mouth, when the lava appeared.

Lava of 1669 deſcribed.

ed liquid as water, and when he ſaw it running with a rapidity equal to the river Severn at the paſſage near Briſtol.—A deſcription of the lava iſſuing from mount Ætna in 1669 was ſent to the court of England by Lord Winchelſea, who at that time happened to be at Catania in his way home from an embaſſy at Conſtantinople. His account is not now to be procured; but Mr Hamilton found a copy in Sicily, and hath given an extract, part of which follows. "When it was night, I went upon two towers in different places; and I could plainly ſee, at ten miles diſtance, as we judged, the fire begin to run from the mountain in a direct line, the flame to aſcend as high and as big as one of the greateſt ſteeples in your Majeſty's kingdoms, and to throw up great ſtones into the air; I could diſcern the river of fire to deſcend the mountain of a terrible fiery or red colour, and ſtones of a paler red to ſwim thereon, and to be ſome as big as an ordinary table. We could ſee this fire to move in ſeveral other places, and all the country covered with fire, aſcending with great flames in many places, ſmoking like to a violent furnace of iron melted, making a noiſe with the great pieces that fell, eſpecially thoſe that fell into the ſea. A cavalier of Malta, who lives there, and attended me, told me, that the river was as liquid, where it iſſues out of the mountain, as water, and came out like a torrent with great violence, and is five or ſix fathom deep, and as broad, and that no ſtones ſink therein."

The account given in the Philoſophical Tranſactions is to the ſame purpoſe. We are there told, that the lava is "nothing elſe than divers kinds of metals and minerals, rendered liquid by the fierceneſs of the fire in the bowels of the earth, boiling up and guſhing forth as the water doth at the head of ſome great river; and having run in a full body for a ſtone's caſt or more, began to cruſt or curdle, becoming, when cold, thoſe hard porous ſtones which the people call *Sciarri*." Thoſe, though cold in compariſon of what firſt iſſues from the mountain, yet retained ſo much heat as to reſemble huge cakes of ſea-coal ſtrongly ignited, and came tumbling over one another, bearing down or burning whatever was in their way.—In this manner the lava proceeded ſlowly on till it came to the ſea, when a moſt extraordinary conflict enſued betwixt the two adverſe elements. The noiſe was vaſtly more dreadful than the loudeſt thunder, being heard through the whole country to an immenſe diſtance; the water ſeemed to retire and diminiſh before the lava, while clouds of vapour darkened the ſun. The whole fiſh on the coaſt were deſtroyed, the colour of the ſea itſelf was changed, and the tranſparency of its waters loſt for many months.

Diameter of the hole whence the lava iſſued.

While this lava was iſſuing in ſuch prodigious quantity, the merchants, whoſe account is recorded in the Philoſophical Tranſactions, attempted to go up to the mouth itſelf; but durſt not come nearer than a furlong, leſt they ſhould have been overwhelmed by a vaſt pillar of aſhes, which to their apprehenſion exceeded twice the bigneſs of St Paul's ſteeple in London, and went up into the air to a far greater height; at the mouth itſelf was a continual noiſe, like the beating of great waves of the ſea againſt rocks, or like diſtant thunder, which ſometimes was ſo violent as to be heard 60, or even 100 miles off; to which diſtance alſo part of the aſhes were carried. Some time after, having gone up, they found the mouth from whence this terrible deluge iſſued to be only a hole about 10 feet diameter. This is alſo confirmed by Mr Brydone; and is probably the ſame through which Sir Wm. Hamilton deſcended into the ſubterranean caverns already mentioned.

Antiquity of the eruptions.

Mount Ætna, as we have already remarked, has been a celebrated volcano from the remoteſt antiquity. Diodorus Siculus mentions eruptions of it as happening 500 years before the Trojan war, or 1693 years before the Chriſtian æra. From Homer's ſilence with regard to the phenomenon of Ætna, it is to be preſumed that the volcano had been many ages in a ſtate of inactivity, and that no tradition of its burning remained among the inhabitants at the time he compoſed his Odyſſey; perhaps it never had emitted flames ſince the country was peopled. The firſt eruption taken notice of by ancient, but by no means cotemporary authors, happened before the Greeks landed on the iſland, and is ſuppoſed to have ſcared the Sicani from the eaſt part of Sicily.

Pindar, quoted above, is the oldeſt writer extant who ſpeaks of Ætna as a volcano. The firſt recorded eruption was in the time of Pythagoras. Plato was invited by the younger Dyoniſius to examine the ſtate of the mountain after the ſixth. It threw up flames and lava near an hundred times between that period and the battle of Pharſalia; it was particularly furious while Sextus Pompeius was adding the horrors of war to its devaſtations. Charlemagne happened to be at Catania during one of the eruptions; and from his reign the chronicles mention fifteen down to that of the year 1669, the moſt terrible of them all. Since 1669 there have been ſeveral eruptions, but none of them comparable to it. In that which happened in 1766, the lava ſprang up into the air to a conſiderable height, twelve miles below the ſummit; but formed a ſtream only ſix miles in length and one mile in breadth.

Account of the late eruption, 1787.

The laſt eruption happened in 1787. From the 1ſt to the 10th of July, there were ſigns of its approach. On the 11th, after a little calm, there was a ſubterraneous noiſe, like the ſound of a drum in a cloſe place, and it was followed by a copious burſt of black ſmoke. It was then calm till the 15th, when the ſame prognoſtics recurred. On the 17th, the ſubterraneous noiſe was heard again; the ſmoke was more abundant, ſlight ſhocks of an earthquake followed, and the lava flowed from behind one of the two little mountains which form the double head of Ætna. On the 18th, while the ſpectators were in anxious expectation of a more ſevere eruption, all was quiet, and continued ſo more than 12 hours: ſoon after they perceived ſome new ſhocks, accompanied with much noiſe; and the mountain threw out a thick ſmoke, which, as the wind was weſterly, ſoon darkened the eaſtern horizon: two hours afterwards a ſhower of fine black brilliant ſand deſcended: on the eaſt ſide it was a ſtorm of ſtones; and, at the foot of the mountain, a deluge of flaſhes of fire, of ſcoria and lava.

Theſe appearances continued the whole day; at the ſetting of the ſun the ſcene changed. A number of conical flames roſe from the volcano; one on the north, another on the ſouth, were very conſpicuous, and roſe and fell alternately. At three in the morning, the mountain appeared cleft, and the ſummit ſeemed a burning maſs. The cones of light which aroſe from the crater were of an immenſe extent, particularly the two juſt mentioned. The two heads ſeemed to be cut away; and at their ſeparation was a cone of flame, ſeemingly compoſed of many leſſer cones. The flame ſeemed of the height of the mountain placed on the mountain; ſo that it was probably two miles high, on a baſe of a mile and a half in diameter. This cone was ſtill covered with a very thick ſmoke, in which there appeared very brilliant flaſhes of lightening, a phenomenon which Ætna had not before afforded. At times, ſounds like thoſe from the exploſion of a large cannon were heard, ſeemingly at a leſs diſtance than the mountain. From the cone, as from a fountain, a jet of many flaming volcanic matters were thrown, which were carried to the diſtance of ſix or ſeven miles: from the baſe of the cone a thick ſmoke aroſe, which, for a moment, obſcured ſome parts of the flame, at the time when the rivers of lava broke out. This beautiful appearance continued three quarters of an hour. It began the next night with more force; but continued only half an hour. In the intervals, however, Ætna continued to throw out flames, ſmoke, ſtones ignited, and ſhowers of ſand. From the 20th to the 22d, the appearances gradually ceaſed. The ſtream of lava was carried towards Bronte and the plain of Lago.

After the eruption, the top of the mountain on the weſtern ſide was found covered with hardened lava, ſcoria, and ſtones. The travellers were annoyed by ſmoke, by ſhowers of ſand, mephitic vapours, and exceſſive heat. They ſaw that the lava which came from the weſtern point divided into two branches, one of which was directed towards Libeccio; the other, as we have already ſaid, towards the plain of Lago. The lava on the weſtern head of the mountain, had from its various ſhapes been evidently in a ſtate of fuſion: from one of the ſpiracula, the odour was ſtrongly that of liver of ſulphur. The thermometer, in deſcending, was at 40 degrees of Fahrenheit's ſcale; while near the lava, in the plain of Lago, it was 140 degrees. The lava extended two miles; its width was from $13\frac{3}{4}$ to 21 feet, and its depth $13\frac{3}{4}$ feet.

Theſe are the moſt remarkable circumſtances we have been able to collect, that might ſerve to give an adequate idea of this famous mountain.—Many things, however, concerning the extent, antiquity, *&c.* of the lavas, remain to be diſcuſſed, as well as the opinions of philoſophers concerning the origin of the internal fire which produces ſo much miſchief: but the conſideration of theſe belongs to the general article VOLCANO, to which the reader is referred.—The fate of *Catania* and *Hybla*, which have often been deſtroyed by eruptions, will be mentioned under theſe two words.

ÆTNA ſalt, Sal Ætnæ, a name given by ſome authors to the ſal ammoniac, which is found on the ſurface and ſides of the openings of Ætna, and other burning mountains after their eruptions; and ſometimes on the ſurface of the ferruginous matter which they throw out. This ſalt makes a very various appearance in many caſes; it is ſometimes found in large and thick cakes, ſometimes only in form of a thin powder, ſcattered over the ſurface of the earth and ſtones. Some of this ſalt is yellow, ſome white, and ſome greeniſh. This ſalt is a concrete of nitre, ſulphur, and vitriol, burnt and ſublimed together; Borelli found once a vaſt quantity of this ſalt on mount Ætna, and tried many experiments on it; from whence he concluded, that this ſalt is ſo far from occaſioning the exploſions of that mountain, as ſome have ſuppoſed, that it does not exiſt in it, but is formed during the burning. Phil. Tranſ. N° 100.

ÆTOLARCHA, in Grecian antiquity, the principal magiſtrate or governor of the Ætolians.

AFER (Domitius), a famous orator, born at Niſmes, flouriſhed under Tiberius and the three ſucceeding emperors. Quintilian makes frequent mention of him, and commends his pleadings. But he diſgraced his talents, by turning informer againſt ſome of the moſt diſtinguiſhed perſonages in Rome. Quintilian, in his youth, cultivated the friendſhip of Domitius very aſſiduouſly. He tells us that his pleadings abounded with pleaſant ſtories, and that there were public collections of his witty ſayings, ſome of which he quotes. He alſo mentions two books of his "*On Witneſſes*." Domitius was once in great danger from an inſcription he put upon a ſtatue erected by him in honour of Caligula, wherein he declared that this prince was a ſecond time a conſul at the age of 27. This he intended as an encomium, but Caligula taking it as a ſarcaſm upon his youth, and his infringement of the laws, raiſed a proceſs againſt him, and pleaded himſelf in perſon. Domitius, inſtead of making a defence, repeated part of the emperor's ſpeech with the higheſt marks of admiration; after which he fell upon his knees, and, begging pardon, declared, that he dreaded more the eloquence of Caligula than his imperial power. This piece of flattery ſucceeded ſo well, that the emperor not only pardoned, but alſo raiſed him to the conſulſhip. Afer died in the reign of Nero, A. D. 59.

AFFA, a weight uſed on the Gold Coaſt of Guinea. It is equal to an ounce, and the half of it is called *eggeba*. Moſt of the blacks on the Gold Coaſt give theſe names to thoſe weights.

AFFECTION, in a general ſenſe, implies an attribute inſeparable from its ſubject. Thus magnitude, figure, weight, &c. are affections of all bodies; and love, fear, hatred, &c. are affections of the mind.*

AFFECTION, ſignifying *a ſettled bent of mind toward a particular being or thing*, occupies a middle ſpace between *diſpoſition* on the one hand, and *paſſion* on the other.† It is diſtinguiſhable from Diſpoſition, which being a branch of one's nature, originally, muſt exiſt before there can be an opportunity to exert it upon any particular object; whereas Affection can never be original, becauſe, having a ſpecial relation to a particular object, it cannot exiſt till the object has once at leaſt been preſented. It is alſo diſtinguiſhable from Paſſion, which, depending on the real or ideal preſence of its object, vaniſhes with its object: whereas Affection is a laſting connection; and, like other connections, ſubſiſts even when we do not think of the perſon. A familiar example will illuſtrate this. There may be in one perſon's mind a diſpoſition to gratitude, which, through want of an object, happens never to be exerted; and which therefore is never diſcovered even by the perſon himſelf. Another, who has the ſame diſpoſition, meets with a kindly office that makes him grateful to his benefactor: An intimate connection is formed between them, termed *affection*: which, like other connections, has a permanent exiſtence, though not always in view. The

*See *Moral Philoſophy*, Part I. ſec. i. iv.

†See *Diſpoſition*, and *Paſſion*.

affection, for the moſt part, lies dormant, till an opportunity offers for exerting it: in that circumſtance, it is converted into the paſſion of gratitude; and the opportunity is eagerly ſeized of teſtifying gratitude in the warmeſt manner.

Affection, among phyſicians, ſignifies the ſame as diſeaſe. Thus the hyſteric *affection* is the ſame with the hyſteric diſeaſe.

AFFERERS, or Afferors, in law, perſons appointed in court-leets, courts-baron, &c. to ſettle, upon oath, the fines to be impoſed upon thoſe who have been guilty of faults arbitrarily puniſhable.

AFFETUOSO, or *Con Affetto*, in the Italian muſic, intimates that the part to which it is added ought to be played in a tender moving way, and conſequently rather ſlow than faſt.

AFFIANCE, in law, denotes the mutual plighting of troth between a man and woman to marry each other.

AFFIDAVIT, ſignifies an oath in writing, ſworn before ſome perſon who is authorized to take the ſame.

AFFINITY, among civilians, implies a relation contracted by marriage; in contradiſtinction to conſanguinity, or relation by blood.—Affinity does not found any real kinſhip; it is no more than a kind of fiction, introduced on account of the cloſe relation between huſband and wife. It is even ſaid to ceaſe when the cauſe of it ceaſes: hence a woman who is not capable of being a witneſs for her huſband's brother during his lifetime, is allowed for a witneſs when a widow, by reaſon the affinity is diſſolved. Yet with regard to the contracting marriage, affinity is not diſſolved by death, though it be in every thing elſe.

There are ſeveral degrees of affinity, wherein marriage was prohibited by the law of Moſes: thus, the ſon could not marry his mother, nor his father's wife (Lev. xviii. 7. et ſeq.): the brother could not marry his ſiſter, whether ſhe were ſo by the father only or by the mother only, and much leſs if ſhe was his ſiſter both by the ſame father and mother: the grandfather could not marry his grand-daughter, either by his ſon or daughter. No one could marry the daughter of his father's wife; nor the ſiſter of his father or mother. Nor the uncle his niece; nor the aunt her nephew. Nor the nephew the wife of his uncle by the father's ſide. The father-in-law could not marry his daughter-in-law: nor the brother the wife of his brother, while living; nor even after the death of his brother, if he left children. If he left no children, the ſurviving brother was to raiſe up children to his deceaſed brother, by marrying his widow. It was forbidden to marry the mother and the daughter at one time, or the daughter of the mother's ſon, or the daughter of her daughter, or two ſiſters together. It is true the patriarchs before the law married their ſiſters, as Abraham married Sarah, who was his father's daughter by another mother; and two ſiſters together, as Jacob married Rachel and Leah; and their own ſiſters by both father and mother, as Seth and Cain. But theſe caſes are not to be propoſed as examples: becauſe in ſome they were authoriſed by neceſſity; in others by cuſtom; and the law as yet was not in being. If ſome other examples may be found, either before or ſince the law, the ſcripture expreſsly diſapproves of them, as Reuben's inceſt with Balah his father's concubine, and the action of Ammon with his ſiſter Tamar; and that of Herod-Antipas, who married Herodias his ſiſter-in-law, his brother Philip's wife, while her huſband was yet living.

Affinity is alſo uſed to denote conformity or agreement: Thus we ſay, the affinity of languages, the affinity of words, the affinity of ſounds, &c.

Affinity, or Elective Attraction, are terms uſed by modern chemiſts to expreſs that peculiar propenſity which different ſpecies of matter have to unite and combine with certain other bodies excluſively, or in preference to any other connection.

AFFIRMATION, in logic, the aſſerting the truth of any propoſition.

Affirmation, in law, denotes an indulgence allowed to the people called *Quakers*; who, in caſes where an oath is required from others, may make a ſolemn affirmation that what they ſay is true; and if they make a falſe affirmation, they are ſubject to the penalties of perjury.

Affirmation is alſo uſed for the ratifying or confirming the ſentence or decree of ſome inferior court: Thus, in England, they ſay, the houſe of lords affirmed the decree of the lord chancellor, or the decree of the lords of ſeſſion.

AFFIRMATIVE, in grammar. Authors diſtinguiſh affirmative particles; ſuch is, *yes*.—The term *affirmative* is ſometimes alſo uſed ſubſtantively. Thus we ſay, the affirmative is the more probable ſide of the queſtion: there were ſo many votes, or voices, for the affirmative.

AFFIX, in grammar, a particle added at the cloſe of a word, either to diverſify its form or alter its ſignification. We meet with *affixes* in the Saxon, the German, and other northern languages; but more eſpecially in the Hebrew, and other oriental tongues. The Hebrew *affixes* are ſingle ſyllables, frequently ſingle letters, ſubjoined to nouns and verbs; and contribute not a little to the brevity of that language. The oriental languages are much the ſame as to the *radicals*, and differ chiefly from each other as to *affixes* and *prefixes*.

AFFLATUS, literally denotes a blaſt of wind, breath, or vapour, ſtriking with force againſt another body. The word is Latin, formed from *ad* "to," and *flare* "to blow." Naturaliſts ſometimes ſpeak of the afflatus of ſerpents. Tully uſes the word figuratively, for a divine inſpiration; in which ſenſe, he aſcribes all great and eminent accompliſhments to a divine afflatus. The Pythian prieſteſs being placed on a tripod or perforated ſtool, over a holy cave, received the divine afflatus, as a late author expreſſes it, in her belly; and being thus inſpired, fell into agitations, like a phrenetic; during which ſhe pronounced, in hollow groans and broken ſentences, the will of the deity. This afflatus is ſuppoſed, by ſome, to have been a ſubterraneous fume, or exhalation, wherewith the prieſteſs was literally inſpired. Accordingly, it had the effects of a real phyſical diſeaſe; the paroxyſm of which was ſo vehement, that Plutarch obſerves it ſometimes proved mortal. Van Dale ſuppoſes the pretended enthuſiaſm of the Pythia to have ariſen from the fumes of aromatics.

AFFLICTION, is not itſelf, in propriety of medical ſpeech, a diſeaſe, but it produces many: for whatever excites envy, anger, or hatred, produces diſeaſes from tenſe fibres; as whatever excites fear, grief, joy or delight, begets diſeaſes from relaxation.

AFFORAGE, in the French cuſtoms, a duty paid to the lord of a diſtrict, for permiſſion to ſell wine, or other liquors, within his ſeignory. Afforage is alſo uſed for the rate or price of proviſions laid and fixed by the provoſt or ſheriffs of Paris.

AFFORESTING, Afforestatio, the turning ground into foreſt. The Conqueror, and his ſucceſſors, continued afforeſting the lands of the ſubject for many reigns; till the grievance became ſo notorious, that the people of all degrees and denominations were brought to ſue for relief; which was at length obtained and commiſſions were granted to ſurvey and perambulate the foreſt, and ſeparate all the new afforeſted lands, and re-convert them to the uſes of their proprietors, under the name and quality of *purlieu* or *pouralle land*.

AFFRAY, or Affrayment, in law, formely ſignified the crime of affrighting other perſons, by appearing in unuſual armour, brandiſhing a weapon, &c. but, at preſent, *affray* denotes a ſkirmiſh or fight between two or more.

AFFRONTEE, in heraldry, an appellation given to animals facing one another on an eſcutcheon; a kind of bearing which is otherwiſe called *confrontee*, and ſtands oppoſed to *adoſſee*.

AFFUSION, the act of pouring ſome fluid ſubſtance on another body. Dr Grew gives ſeveral experiments of the luctation ariſing from the affuſion of divers menſtruums on all ſorts of bodies. Divines and church hiſtorians ſpeak of baptiſm by affuſion; which amounts to much the ſame with what we now call *ſprinkling*.

AFRANIUS, a Latin poet, who wrote comedies in imitation of Menander, commended by Tully and Quintilian: he lived in the 170th olympiad.

AFRICA (according to Bochart, from a Punic word, ſignifying *Ears of Corn*); one of the four great diviſions, by the moderns called *quarters*, of the world, and one of the three called by the Greeks Ηπειροι, or *continents*. By them it was alſo called *Lybia*.

Africa lies ſouth of Europe, and weſt of Aſia. It is bounded on the north by the Mediterranean, which ſeparates it from the former; on the north-eaſt, by the Red Sea, which divides it from Aſia, and to which it is attached by a neck of land called the *Iſthmus of Suez*, about 60 miles over, ſeparating the Mediterranean from the Red Sea. On the weſt, ſouth, and eaſt, it is bounded by the main ocean: ſo that it is properly a vaſt peninſula, bearing ſome faint reſemblance of a pyramid, the baſe of which is the northern part, running along the ſhores of the Mediterranean; and the top of the pyramid is the moſt ſoutherly point, called the *Cape of Good Hope*. Its greateſt length from north to ſouth is 4300 miles, and its greateſt breadth from eaſt to weſt is 3500 miles; reaching from Lat. 37° N. to 35° S. and from Long. 17-20° W. to 51-20° E.

Though the greateſt part of this continent hath been in all ages unknown both to the Europeans and Aſiatics, its ſituation is more favourable than either Europe or Aſia for maintaining an intercourſe with other nations. It ſtands, as it were, in the centre of the three other quarters of the globe; and has thereby a much nearer communication with Europe, Aſia, and America, than any one of theſe has with another. For, (1.) It is oppoſite to Europe in the Mediterranean, for almoſt 1000 miles in a line from eaſt to weſt; the diſtance ſeldom 100 miles, never 100 leagues, and ſometimes not above 20 leagues. (2.) It is oppoſite to Aſia for all the length of the Red Sea, the diſtance ſometimes not exceeding five leagues, ſeldom fifty. (3.) Its coaſt for the length of about 2000 miles lies oppoſite to America at the diſtance of from 500 to 700 leagues, including the iſlands: whereas America, unleſs where it may be a *terra incognita*, is no where nearer Europe than 1000 leagues; and Aſia, than 2500.

As the equator divides this continent almoſt in the middle, the far greateſt part of it is within the tropics; and of conſequence the heat in ſome places is almoſt inſupportable by Europeans, it being there greatly increaſed by vaſt deſarts of burning ſand.—It cannot be doubted, however, that, were the country well cultivated, it would be extremely fertile; and would produce in great abundance not only the neceſſaries, but alſo the luxuries, of life. It has been aſſerted, that the ſugars of Barbadoes and Jamaica, as alſo the ginger, cotton, rice, pepper, pimento, cocoa, indigo, &c. of theſe iſlands, would thrive in Africa to as much perfection as where they are now produced. Nor can it be doubted, that the Eaſt Indian ſpices, the tea of China and Japan, the coffee of Mocha, &c. would all thrive in ſome parts of the African coaſt; as this continent has the advantage of feeling no cold, the climate being either very warm or very temperate.

Whatever may be the caſe with the internal parts of Africa, it is certain that its coaſts are well watered with many very conſiderable rivers. The Nile and the Niger may be reckoned among the largeſt in any part of the world, America excepted. The firſt diſcharges itſelf into the Mediterranean, after a prodigious courſe from its ſource in Abyſſinia. The origin neither of the Nile, nor of the Niger, is certainly known; but that of the latter is ſuppoſed to run through a tract of land little leſs than 3000 miles. Both theſe rivers annually overflow their banks, fertilizing by that means the countries through which they paſs. The Gambia and Senegal rivers are only branches of the Niger. Many vaſt ridges of mountains alſo run through different parts of this continent; but their extent is very little known. Some of the moſt remarkable are, (1.) Thoſe called *Atlas*, lying between the 20th and 25th degree of north latitude, and ſuppoſed almoſt to divide the continent from eaſt to weſt. (2.) The *mountains of the moon*, ſo called on account of their great height; ſuppoſed to be the boundaries between Abyſſinia and ſome of the interior kingdoms. (3.) The mountains of *Sierra Leona*, ſo called on account of their abounding with lions, and likewiſe ſuppoſed to be the boundaries of ſome of the nations. (4.) Thoſe called by the ancients the *mountains of God*, on account of their being ſubject to perpetual thunder and lightening. Of all theſe, however, little more is known than their names.

To what we have already ſaid concerning the produce of Africa, we may add, that no part of the world abounds with gold and ſilver in a greater degree. Here alſo are a prodigious number of elephants; and it is ſurpriſing, that neither the ancients nor modern Europeans, notwithſtanding their extravagant and inſatiable thirſt after gold and ſilver, ſhould have endeavoured to eſtabliſh themſelves effectually in a country much nearer to them than either America or the Eaſt Indies; and where the objects of their deſire are found in equal, if not greater, plenty.

Next to gold and ſilver, copper is the moſt valuable metal; and on this continent is found in great plenty, inſomuch that the mountains of Atlas abovementioned are ſaid all to be compoſed of copper ore. In ſhort, Africa, though a full quarter of the globe, ſtored with an inexhauſtible treaſure, and capable of producing almoſt every neceſſary, conveniency, and luxury of life, within itſelf, ſeems to be utterly neglected both by its own inhabitants and all other nations: the former, being in a ſavage ſtate, are incapable of enjoying the bleſſings offered them by nature; and the latter taking no farther notice of the inhabitants, or their land, than to obtain at the eaſieſt rate what they procure with as little trouble as poſſible, or to carry them off for ſlaves to their plantations in America.

Only a ſmall part of this continent was known to the ancients, *viz.* the kingdom of Egypt, and the northern coaſt, comprehending little more than what is now known by the name of *Barbary*. It was divided into *Africa Propria*, and *Africa Interior*. Africa Propria comprehended only the Carthaginian territories. Africa Interior comprehended all other nations to the ſouthward of theſe territories, or thoſe at a greater diſtance from Rome. The only kingdoms, however, with which the Romans had any connection, were the Numidians, the Mauritanians, and the Gætuli. All theſe, as well as Egypt, were ſwallowed up by that enormous power, and reduced to the condition of Roman provinces. But the Romans never ſeem to have penetrated beyond the tropic of cancer. There appears, indeed, to have been ſome intercourſe between them and the Ethiopians: but the latter always preſerved their liberty; and we find their queen Candace mentioned in the times of the apoſtles, when the Roman power was at its higheſt pitch.

Between the tropic of cancer and the equinoctial line, a multitude of ſavage nations were ſuppoſed to have their reſidence, known by the names of Melanogætuli, Nigritæ, Blemmyes, Dolopes, Aſtacuri, Lotophagi, Ichthyophagi, Elephantophagi, &c. (which are taken notice of, as well as the others already mentioned, under their proper names); but that Africa was a peninſula, ſeems to have been totally unknown both to the Europeans and Aſiatics for many ages.—It is probable indeed, that ſome of the Phenicians, and their offspring the Carthaginians, were not ſo ignorant; as they carried navigation to a much greater height than either the Greeks or Romans: but their diſcoveries were all concealed with the greateſt care, leſt other nations ſhould reap the benefit of them; and accordingly we can now find no authentic accounts concerning them. The navigation round Africa, in particular, is recorded by the Greek and Roman writers rather as a ſtrange amuſing tale than as a real tranſaction; and as neither the progreſs of the Phenician and Carthaginian diſcoveries, nor the extent of their navigation, were communicated to the reſt of mankind, all memorials of their extraordinary ſkill in naval affairs ſeem in a great meaſure to have periſhed, when the maritime power of the former was annihilated by Alexander's conqueſt of Tyre, and the empire of the latter was overturned by the Romans.

That the peninſula of Africa, however, was in reality ſailed round by the Phenicians, we have on indiſputable authority; for ſome of that nation undertook the voyage, at the command of Necho king of Egypt, about 604 years before the Chriſtian æra. They ſailed from a port in the Red-ſea, and after three years returned by the Mediterranean: and the very objections that were made to the veracity of their accounts at that time, are unanſwerable proofs to us that this voyage was really accompliſhed. They pretended, that, having ſailed for ſome time, the ſun became more and more vertical, after which he appeared in the north, and ſeemed to recede from them: that as they returned, the ſun gradually ſeemed to move ſouthwards; and, after becoming vertical once more, appeared then in the ſouth ſide of them as before they ſet out. This, which we know muſt certainly have been the caſe, was deemed incredible at that time, and univerſal ignorance concerning the extent of this continent prevailed till the 15th century. The firſt attempts towards attaining a knowledge of Africa was made by the Portugueſe in 1412. Notwithſtanding their vicinity, they had never ventured beyond Cape *Non*, ſituated in about N. lat. 27°: it had received its name from a ſuppoſed impoſſibility of paſſing it. This year they proceeded 160 miles farther, to Cape Bojador; which ſtretching a conſiderable way into the Atlantic ocean, with rocky clifts, appeared ſo dreadful to the navigators, that they returned without any attempt to paſs it. In an attempt to double this formidable cape, they diſcovered the Madeira iſlands in 1419: but Cape Bojador continued to be the boundary of their continental diſcoveries till 1433; when they penetrated within the tropics, and in a few years diſcovered the river Senegal, Cape de Verd, and the iſlands which lie off that promontory. In 1449, the weſtern iſlands, called the *Azores*, were diſcovered: and in 1471, they firſt penetrated beyond the line; and were ſurpriſed to find, that the torrid zone, contrary to the opinion of the ancients, who imagined it to be burnt up with heat, was not only habitable, but fertile and populous. In 1484, they proceeded 1500 miles beyond the line; ſo that they began to entertain hopes of finding that way a paſſage to the Eaſt Indies: and two years afterwards, the Cape of Good Hope was diſcovered by Bartholomew de Diaz; but it was not till the year 1497, that the Portugueſe, under Vaſquez de Gama, actually doubled this cape, and diſcovered the true ſhape of the continent. Thus the coaſts of Africa were made perfectly known; and probably the knowledge concerning its interior parts would have been much greater than it is, had not the general attention been called off from this continent by the diſcovery of America in 1492.

The Romans for a long time maintained their power in Africa: but in the year 426, Bonifacius, ſupreme governor of all the Roman dominions in this quarter, being compelled to revolt by the treachery of another general called *Aetius*, and finding himſelf unable to contend with the whole ſtrength of the Roman empire, called in Genſeric king of the Vandals to his aid; who thereupon abandoned the provinces he had ſeized in Europe, and paſſed over into Africa. Bonifacius, however, being ſoon after reconciled to his empreſs Placidia, endeavoured in vain to perſuade the Vandals to retire. Hereupon a war enſued, in which the barbarians proved victorious, and quickly over-ran all the Roman provinces in Africa. In the year 435, a peace was concluded; when Numidia and ſome other countries were ceded to the Vandals, who ſoon after ſeized all the reſt. Theſe barbarians did not long enjoy their ill-gotten poſſeſſions: for, about the year 533, Beliſarius drove them out, annexing the provinces to the eaſtern empire; and in 647, the Saracens, having conquered Meſopotamia, Egypt (which anciently was not included in the meaning of the word *Africa*), Phenicia, Arabia, and Paleſtine, broke like a torrent into Africa, which they quickly ſubdued. Their vaſt empire being in 936 divided into ſeven kingdoms, the African ſtates retained their independency long after the others were ſubdued by the Turks: but in the beginning of the 16th century, being afraid of falling under the yoke of Spain, they invited the Turks to their aſſiſtance; who firſt protected, and then enſlaved, them. They ſtill continue in a kind of dependence on the Ottoman empire. They are not, however, properly ſpeaking, the *ſubjects* of the grand Signior, but call him their *protector*, paying him an annual tribute. On the coaſts, the natives are almoſt all addicted to piracy; and with ſuch ſucceſs have they carried on their employment, that the greateſt powers in Europe are become their tributaries, in order to procure liberty to trade on the Mediterranean.

Concerning even thoſe ſtates which are neareſt to Europe, very little is known: but the interior nations are ſcarce known by name; nor do almoſt any two of the moſt learned moderns agree in their diviſion of Africa into kingdoms; and the reaſon is, that ſcarcely any traveller hath ever penetrated into theſe inhoſpitable regions. According to the beſt accounts, concerning thoſe regions of Africa lying beyond Egypt and Barbary, they are divided in the following manner. On the weſtern coaſt, to the ſouth of Barbary, lie the kingdoms of Bildulgerid, Zaara, Negroland, Loango, Congo, Angola, Benguela, and Terra de Natal. On the eaſtern coaſt beyond Egypt, are thoſe of Nubia, Adel, Ajan, Zanguebar (between theſe two a huge deſart is interpoſed), Monomatapa, and Sofola. In the interior parts, the kingdoms of Lower Ethiopia, Abex, Monemuge, and Matanan, are made mention of. The ſouthermoſt part, called Caffraria, is well known for the habitation of the Hottentots.

In many material circumſtances, the inhabitants of this extenſive continent agree with each other. If we except the people of Abyſſinia, who are tawny, and profeſs a mixture of Chriſtianity, Judaiſm, and Paganiſm, they are all of a black complexion. In their religion, except on the ſea-coaſts, which have been viſited and ſettled by ſtrangers, they are pagans; and the form of government is every where monarchical. Few princes, however, poſſeſs a very extenſive juriſdiction; for as the natives of this part of Africa are groſsly ignorant in all the arts of utility or refinement, they are little acquainted with one another; and generally united in ſmall ſocieties, each governed by its own prince. In Abyſſinia, indeed, as well as in Congo, Loango, and Angola, we are told of powerful monarchs; but on examination, it is found that the authority of theſe princes ſtands on a precarious footing, each tribe or ſeparate body of their ſubjects being under the influence of a petty chieftain of their own, ſtyled *Negus*, to whoſe commands, however contrary to thoſe of the Negaſcha Negaſcht, or king of kings, they are always ready to ſubmit.

The fertility of a country ſo prodigiouſly extenſive, might be ſuppoſed more various than we find it is: in fact, there is no medium in this part of Africa with regard to the advantages of ſoil; it is either perfectly barren or extremely fertile. This ariſes from the intenſe heat of the ſun; which, where it meets with ſufficient moiſture, produces the utmoſt luxuriancy; and in thoſe countries where there are few rivers, reduces the ſurface of the earth to a barren ſand. Of this ſort are the countries of Anian and Zaara; which, for want of water, and conſequently of all other neceſſaries, are reduced to perfect deſarts, as the name of the latter denotes. In thoſe countries, on the other hand, where there is plenty of water, and particularly where the rivers overflow the land part of the year, as in Abyſſinia, the productions of nature, both of the animal and vegetable kinds, are found in the higheſt perfection and greateſt abundance. The countries of Mandingo, Ethiopia, Congo, Angola, Batua, Truticui, Monomotapa, Caſati, and Mehenemugi, are extremely rich in gold and ſilver. The baſer metals, likewiſe, are found in theſe and many other parts of Africa. But the perſons of the natives make the moſt conſiderable article in the produce and traffic of this miſerable quarter of the globe.

On the Guinea or weſtern coaſt, the Engliſh trade to James Fort, and other ſettlements near and up the river Gambia; where they exchange their woollen and linen manufactures, their hardware, and ſpirituous liquors, for the perſons of the natives. By the treaty of peace in 1783, the river of Senegal, with its dependencies, were given up to France. Gold and ivory, next to the ſlave trade, form the principal branches of African commerce. Theſe are carried on from the ſame coaſt, where the Dutch and French, as well as Engliſh, have their ſettlements for this purpoſe.

The Portugueſe are in poſſeſſion of the eaſt and weſt coaſt of Africa, from the Tropic of Capricorn to the Equator; which immenſe tract they became maſters of by their ſucceſſive attempts and happy diſcovery and navigation of the Cape of Good Hope. From the coaſt of Zanguebar, on the eaſtern ſide, they trade not only for the articles abovementioned, but likewiſe for ſeveral others; as ſena, aloes, civet, ambergris, and frankincenſe. The Dutch have ſettlements towards the ſouthern part of the continent, in the country called Caffraria, or the land of the Hottentots, particularly Cape Town, which is well ſettled and fortified; here their ſhips bound for India uſually put in, and trade with the natives for their cattle, in exchange for which they give them ſpirituous liquors.

The Portugueſe being ſovereigns of the greateſt part of the coaſt, have a number of black princes their tributaries. There are ſome independent princes who have extenſive dominions; particularly the kings of Dahome and Widah, the moſt noted of any for the infamous ſlave trade. Upwards of 200 years have the European nations traded with Africa in human fleſh; and encouraged in the Negro countries, wars, rapine, deſolation, and murder, that the Weſt India iſlands might be ſupplied with that commodity. The annual exportation of poor creatures from Africa for ſlaves hath exceeded 100,000; numbers of whom are driven down like ſheep, perhaps a 1000 miles from the ſea-coaſt, who are generally inhabitants of villages that have been ſurrounded in the night by armed force, and carried off to be ſold to traders.—Nor do the planters, who purchaſe them, uſe any pains to inſtruct them in religion, to make them amends for the oppreſſion thus exerciſed on them. It is ſaid they are unnaturally averſe to every thing that tends to it; yet the Portugueſe, French, and Spaniards, in their ſettlements, ſucceed in their attempts to inſtruct them, as much to the advantage of the commerce as of religion. It is for the ſake of Chriſtianity, and the advantages accompanying it, that Engliſh ſlaves embrace every occaſion of deſerting to the ſettlements of theſe nations.—But upon this ſubject the feelings and reflection of that nation have of late been abundantly rouſed, and in the inveſtigation of it the wiſdom of the legiſlature is ſoon to be employed.

AFRICAN Company, a ſociety of merchants, eſtabliſhed by King Charles II. for trading to Africa; which trade is now laid open to all the ſubjects, paying 10 *per cent.* for maintaining the forts.

AFRICANUS (Julius), an excellent hiſtorian of the third century, the author of a chronicle which was greatly eſteemed, and in which he reckons 5500 years from the creation of the world to Julius Cæſar. This work, of which we have now no more than what is to be found in Euſebius, ended at the 221ſt year of the vulgar æra. Africanus alſo wrote a letter to Origen on the hiſtory of Suſanna, which he reckoned ſuppoſititious; and we have ſtill a letter of his to Ariſtides, in which he reconciles the ſeeming contradictions in the two genealogies of Chriſt recorded by St Matthew and St Luke.

AFSLAGERS, perſons appointed by the burgomaſters of Amſterdam to preſide over the public ſales made in that city. They muſt always have a clerk of the ſecretary's office with them, to take an account of the ſale. They correſpond to our brokers, or auctioneers.

AFT, in the ſea language, the ſame with Abaft.

AFTERBIRTH, in midwifery, ſignifies the membranes which ſurround the infant in the womb, generally called the ſecundines. See Midwifery.

AFTERMATH, in huſbandry, ſignifies the graſs which ſprings or grows up after mowing.

AFTERNOON, the latter half of the artificial day, or that ſpace between noon and night.

AFTER-PAINS, in midwifery, exceſſive pains felt in the groin, loins, &c. after the woman is delivered.

AFTER-SWARMS, in the management of bees, are thoſe which leave the hive ſome time after the firſt has ſwarmed. See Bee.

AFWESTAD, a large copper-work belonging to the crown of Sweden, which lies on the Dala, in the province of Dalecarlia, in Sweden. It looks like a town, and has its own church. Here they make copper-plates; and have a mint for ſmall ſilver coin, as well as a royal poſt-houſe. W. Long. 14. 10. N. Lat. 58. 10.

AGA, in the Turkiſh language, ſignifies a great lord or commander. Hence the aga of the Janiſſaries is the commander in chief of that corps; as the general of horſe is denominated *ſpaheclar aga*. The aga of the Janiſſaries is an officer of great importance. He is the only perſon who is allowed to appear before the Grand Signior without his arms acroſs his breaſt in the poſture of a ſlave. Eunuchs at Conſtantinople are in poſſeſſion of moſt of the principal poſts of the ſeraglio: The title *aga* is given to them all, whether in employment or not. This title is alſo given to all ſuch men without employ, and eſpecially to wealthy landholders.

We find alſo *agas* in other countries. The chief officers under the Khan of Tartary are called by this name. And among the Algerines, we read of *agas* choſen from among the *boluk baſhis* (the firſt rank of military officers), and ſent to govern in chief the towns and garriſons of that ſtate. The *aga* of Algiers is the preſident of the divan, or ſenate. For ſome years, the *aga* was the ſupreme officer; and governed the ſtate in the place of baſhaw, whoſe power dwindled to a ſhadow. But the ſoldiery riſing againſt the *boluk baſhis*, or *agas*, maſſacred moſt of them, and transferred the ſovereign power to the calif, with the title of *Dey* or King.

AGADES, a kingdom and city of Negroland in Africa. It lies nearly under the tropic of Cancer, between Gubur and Cano. The town ſtands on a river that falls into the Niger; it is walled, and the king's palace is in the midſt of it. The king has a retinue, who ſerve as a guard. The inhabitants are not ſo black as other negroes, and conſiſt of merchants and artificers. Thoſe that inhabit the fields are ſhepherds or herdſmen, whoſe cottages are made of boughs, and are carried about from place to place on the back of oxen. They are fixed on the ſpot of ground where they intend to feed their cattle. The houſes in the city are ſtately, and built after the Barbary faſhion. This kingdom was, and may be ſtill, tributary to the king of Tombut. It is well watered; and there is great plenty of graſs, cattle, ſena, and manna. The prevailing religion is the Mahometan, but very looſely profeſſed. N. Lat. 26. 10. E. Long. 9. 10.

AGALLOCHUM. See Xylo Aloes.

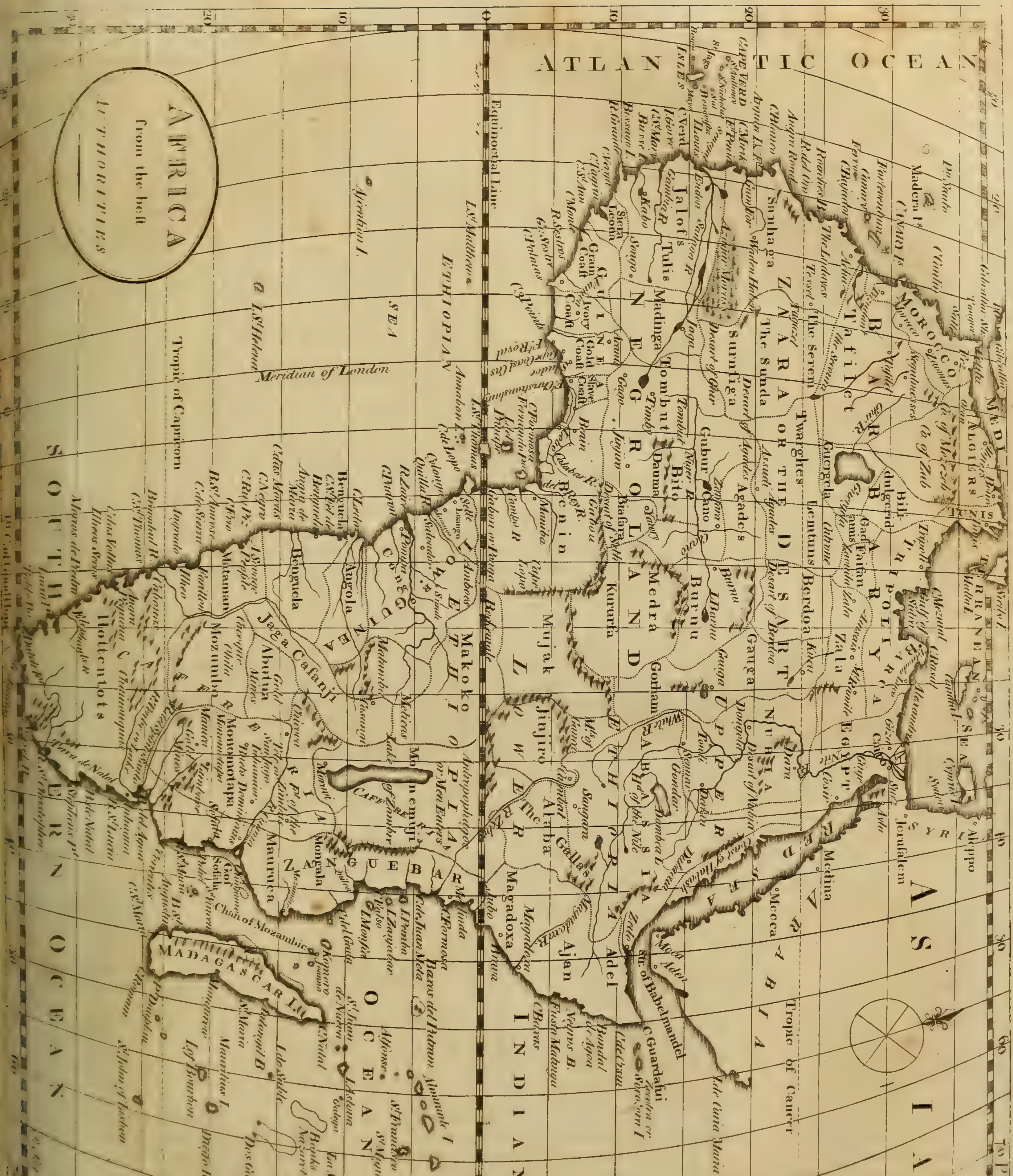
AGALMATA, in antiquity, a term originally uſed to ſignify any kind of ornaments in a temple; but afterwards for the ſtatues only, as being moſt conſpicuous.

AGAMEMNON, the ſon of Atreus by Erope, was captain-general of the Trojan expedition. It was foretold to him by Caſſandra, that his wife Clytemneſtra would be his death: yet he returned to her; and accordingly he was ſlain by Ægiſthus, who had gained upon his wife in his abſence, and by her means got the government into his own hands.

AGANIPPIDES, in ancient poetry, a deſignation given to the muſes, from a fountain of mount Helicon, called *Aganippe*.

AGANIPPE, in antiquity, a fountain of Bœotia at mount Helicon, on the borders between Phocis and Bœotia, ſacred to the muſes, and running into the river Permeſſeus; (Pliny, Pauſanias.) Ovid ſeems to make *Aganippe* and *Hippocrene* the ſame. Solinus more truly diſtinguiſhes them, and aſcribes the blending them to poetical licenſe.

AGAPE, in eccleſiaſtical hiſtory, the love-feaſt, or feaſt of charity, in uſe among the primitive Chriſtians;



AFRICA from the best AUTHORITIES

when a liberal contribution was made by the rich to feed the poor. The word is Greek, and ſignifies *love.* St Chryſoſtom gives the following account of this feaſt, which he derives from the apoſtolical practice. He ſays, "the firſt Chriſtians had all things in common, as we read in the Acts of the apoſtles; but when that equality of poſſeſſions ceaſed, as it did even in the Apoſtles time, the agape, or love-feaſt, was ſubſtituted in the room of it. Upon certain days, after partaking of the Lord's ſupper, they met at a common feaſt; the rich bringing proviſions, and the poor who had nothing being invited." It was always attended with receiving the holy ſacrament; but there is ſome difference between the ancient and modern interpreters as to the circumſtance of time, viz. Whether this feaſt was held before or after the communion. St Chryſoſtom is of the latter opinion; the learned Dr Cave of the former.—Theſe love-feaſts, during the three firſt centuries, were held in the church without ſcandal or offence; but, in after times, the heathens began to tax them with impurity. This gave occaſion to a reformation of theſe *agapæ.* The kiſs of charity, with which the ceremony uſed to end, was no longer given between different ſexes; and it was expreſsly forbidden to have any beds or couches, for the conveniency of thoſe who ſhould be diſpoſed to eat more at their eaſe. Notwithſtanding theſe precautions, the abuſes committed in them became ſo notorious, that the holding of them (in churches at leaſt) was ſolemnly condemned, at the council of Carthage, in the year 397.

AGAPETÆ, in eccleſiaſtical hiſtory, a name given to certain virgins and widows, who, in the ancient church, aſſociated themſelves with, and attended on, eccleſiaſtics, out of a motive of piety and charity.

In the primitive days there were women inſtituted DEACONESSES; who, devoting themſelves to the ſervice of the church, took up their abode with the miniſters, and aſſiſted them in their functions. In the fervour of the primitive piety, there was nothing ſcandalous in theſe ſocieties: but they afterwards degenerated into libertiniſm; inſomuch, that St Jerom aſks with indignation, *unde, agapetarum peſtis in eccleſias introiit?* This gave occaſion to councils to ſuppreſs them.—St Athanaſius mentions a prieſt, named Leontius, who to remove all occaſion of ſuſpicion, offered to mutilate himſelf, to preſerve his beloved companion.

AGARD (Arthur), a learned Engliſh antiquarian, born at Toſton in Derbyſhire in the year 1540. His fondneſs for Engliſh antiquities induced him to make many large collections; and his office as deputy chamberlain of the exchequer, which he held 45 years, gave him great opportunities of acquiring ſkill in that ſtudy. Similarity of taſte brought him acquainted with Sir Robert Cotton, and other learned men, who aſſociated themſelves under the name of *The Society of Antiquarians,* of which ſociety Mr Agard was a conſpicuous member. He made the doomſday-book his peculiar ſtudy; and compoſed a work purpoſely to explain it, under the title of *Tractatus de uſu et obſcurioribus verbis libri de Domeſday:* he alſo compiled a book for the ſervice of his ſucceſſors in office, which he depoſited with the officers of the king's receipt, as a proper index for ſucceeding officers. All the reſt of his collections, containing at leaſt twenty volumes, he bequeathed to Sir Robert Cotton; and died in 1615.

AGARIC. See AGARICUS.

Female AGARIC. See BOLETUS.

Mineral AGARIC, a marley earth reſembling the vegetable of that name in colour and texture. It is found in the fiſſures of rocks, and on the roofs of caverns; and is ſometimes uſed as an aſtringent in fluxes, hemorrhagies, &c.

AGARICUS, or MUSHROOM, a genus of the order of fungi, belonging to the cryptogamia claſs of plants.

Species and uſes. Botanical writers enumerate 55 ſpecies belonging to this genus; of which the moſt remarkable are the following.

1. The campeſtris, or common muſhroom, has the top or cap firſt of a dirty cream colour, convex, and, if but juſt expanding, the under part, or what is called the *gills,* is of a bright fleſh red: this colour laſts but a little time before it turns darker; and when the plant is old, or has been ſometime expanded, the gills become of a dark brown, the cap almoſt flat, of a dirty colour, and often a litle ſcaly. It differs much in ſize in different plants, it being from an inch to ſeven inches broad. The general uſe of it is well known. It is found in woods, old paſtures, and by road-ſides, and is in the greateſt perfection in September. There is a variety of this with a yellowiſh white cap and white gills; this is very firm, but ſeldom expands ſo freely as the true ſort, and when broiled will exude a yellowiſh juice. It is probable this ſort is not pernicious, though it is always rejected by ſuch as can diſtinguiſh it.

2. The pratenſis, or *champignion,* is very common upon heaths and dry paſtures. A number of them generally come up in a place, ranged in curved lines or circles. The cap is ſmall, almoſt flat, from one to two or three inches diameter, of a pale buff colour, often crimpled at the edges, and, when dry, tough like leather or a thin piece of fine cork. The gills are of the colour of the cap; are thinly placed; with a ſhort one, and ſometimes two, coming from the edge of the cap between each. The ſtalk or pillar is alſo of the colour of the cap; it is long, ſlender, and all the way of a thickneſs. This plant has but little ſmell; is rather dry; and yet, when broiled or ſtewed, it communicates a good flavour. In perfection at the ſame time with the former.

3. The chantarellus, *chantarelle agaric,* is rather a ſmaller fungus than the former. The cap is yellow, of different hues in different plants, ſome being of a pale yellow, and others of an orange colour. It is generally ſunk in the middle, ſomewhat reſembling a tunnel, and its edges are often twiſted and contorted ſo as to form ſinuſes or angles. The gills are of a deeper colour than the outſide, are very fine, even, numerous, and beautifully branched. The ramifications begin at the ſtalk, and are variouſly extended towards the edge of the cap. The pillar is of the ſame colour as the cap, is ſeldom inſerted in the centre, but rather ſideways; it is ſhort, thickiſh at the root, and the gills moſtly run down the top, which make it appear ſmalleſt in the middle. This plant broiled with ſalt and pepper has much the flavour of a roaſted cockle; and is eſteemed a delicacy by the French, as is the former. It is found in woods and high paſtures, and is in perfection about the end of September.

4. The delicioſus, or orange agaric. The general

ſize of the cap of this ſpecies is from two to four inches broad. Its form is circular, with the edges bent inwards: convex on the upper ſurface, except in the centre, where it is a little depreſſed, ſo as nearly to reſemble the apex of a ſmooth apple. The colour is a ſordid yellow, ſtreaked with aſh and yellowiſh brown, from the centre to the edge, and when it is broken it emits a gold-colour juice. The gills are of a deep yellow, and a few of them come out by pairs at the ſtalk, but divide immediately, and run ſtraight to the edge of the cap. The ſtalk or pillar is thinneſt near the middle, thickeſt at the root, and when cut tranſverſely, it is quite white in the centre, with a fine yellow ring that goes to the edge. The fungus, well ſeaſoned and then broiled, has the exact flavour of a roaſted muſcle. Its prime time is September, and it is to be found in high dry woods.

5. The cinnamomeus, or brown muſhroom, has a cap the colour of freſh tanned-hides. At firſt it is hemiſpherical, firm, even and fleſhy, with moſtly a ſmall riſing in the centre; but when old it is quite flat. The gills are of a yellowiſh brown, not very diſtant from each other, bent like a knee at the pillar, and have a ſhort one or two run from the edge of the cap between each. The pillar is near the length of a finger, firm, rather thick, brown at the baſe, of a ſordid yellow upward, and, when cut tranſverſely, of a fine white grain. The cap in different plants is from two to five inches broad. The whole plant has a pleaſant ſmell, and when broiled gives a good flavour. It is found in woods in September and October.

6. The violaceus, or violet muſhroom. Its cap, when firſt expanded, is ſmooth, hemiſpherical, the main ſurface of a livid colour, but towards the margin it is of a better blue. When full grown or old, it becomes corrugated, and of a ruſty brown. The gills of a young plant are of a beautiful violet colour, and regularly placed. The pillar is of the colour of the gills, ſhort, of a conical form, but ſwelled at the baſe into a ſort of bulb. Its upper part is ſurrounded with an iron-coloured wool, which, in a plant juſt expanding, ſtretches croſs to the edge of the cap like a web. This ſpecies requires much broiling; but when ſufficiently done and ſeaſoned, it is as delicious as an oyſter. It is found in woods in October. Hudſon's bulboſus is only a variety of this plant.

The above are the only ſpecies that can be ſafely recommended as edible; though there are ſome other ſorts which are frequently eaten by the country people; and it is probable the greateſt part of thoſe with firm fleſhy caps might be eaten with ſafety, provided they were choſen from dry grounds. It is well known that ſoil and ſituation have a great influence upon the properties of plants; and theſe being of a ſingular nature, and abſolutely between that of an animal and vegetable, may be more powerfully affected than a complete ſpecies of either, by reaſon they have neither leaves nor branches to carry off the noxious damps and vapours of a ſtagnant ſoil, as a perfect vegetable has; nor have they any groſs excremental diſcharges, like thoſe of a living animal. The gills no doubt do exhale ſome of their ſuperfluous moiſture; but their ſituation is ſuch, that any thick ſteam from the earth may lodge in them, and by clogging their excretory ducts, render the plants morbid. Thus they ſoon run into a ſtate of putrefaction, and become a prey to worms, flies, and other inſects. The common muſhroom, which is in general eſteem (though we have ſeveral others better) is not ſafely eaten when produced upon a moiſt ſoil. Thoſe who gather muſhrooms for ſale ſhould therefore have particular regard to the lands they collect them from, eſpecially if they know they are to be broiled; but if they be intended for catchup, perhaps they may be leſs cautious, as the ſalt and ſpices with which the juice is boiled may correct any evil diſpoſition in the plants. But, even in this caſe, catchup made of muſhrooms taken from a dry ſoil has a more aromatic and pleaſant flavour than that which is made of thoſe taken from a moiſt one, and it will always keep a great deal better.

Of the poiſonous ſorts, the two following are the moſt ſingular:

7. The muſcarius, or reddiſh muſhroom, has a large hat almoſt flat, either white, red, or crimſon, ſometimes beſet with angular red warts; the gills are white, flat, and inverſely ſpear-ſhaped; the pillar is hollow, the cap fixed to the middle of the pillar, limber, and hanging down. This ſpecies grows in paſtures, and is ſaid to deſtroy bugs effectually if the juice is rubbed upon the walls and bed-poſts. The inhabitants of the north of Europe, whoſe houſes are greatly infeſted with flies at the decline of ſummer, infuſe it in milk, and ſet it in their windows, and the flies upon taſting the leaſt drop are inſtantly poiſoned. An infuſion of common pepper in milk anſwers the ſame purpoſe: but the flies through time become wiſe enough not to taſte it; and though vaſt numbers are at firſt deſtroyed, it is impoſſible to clear a houſe of theſe inſects by this means.—This is the *moucho-more* of the Ruſſians, Kamtſchadales, and Koriacs, who uſe it as an inſtrument of intoxication. They ſometimes eat it dry, ſometimes immerſed in a fermented liquor made with the epilobium, which they drink notwithſtanding the dreadful effects. They are firſt ſeized with convulſions in all their limbs, then with a raving ſuch as attends a burning fever. A thouſand phantoms, gay or gloomy (according to their conſtitutions), preſent themſelves to their imaginations: ſome dance, others are ſeized with unſpeakable horrors. They perſonify this muſhroom; and, if its effects urge them to ſuicide, or any dreadful crime, they ſay they obey its commands. To fit themſelves for premeditated aſſaſſinations, they take the mouchomore. Such is the faſcination of drunkenneſs among theſe people, that nothing can induce them to forbear this dreadful potion!

8. The clypeatus, or long ſtalked muſhroom, has an hemiſpherical hat tapering to a point, and clammy; the pillar is long, cylindrical, and white; the gills are white, and not concave, duſted with a fine powdery ſubſtance on each ſide; the root is bulbous, long, and hooked at the end. It is found in September, in woodlands and paſtures. This ſpecies is thought to be poiſonous; and we have the following acccount of the ſymptoms produced by eating it, in Dr Percival's Eſſays. "Robert Uſherwood, of Middleton, near Mancheſter, a ſtrong healthy man, aged 50 years, early in the morning gathered and eat what he ſuppoſed to be a muſhroom. He felt no ſymptoms of indiſpoſition, till five o'clock in the evening: when, being very thirſty, he drank near a quart of table-beer. Soon afterwards he became univerſally ſwoln, was ſick, and in great agonies. A ſevere vomiting and purging

ſucceeded, with violent cramps in his legs and thighs. He diſcharged ſeveral pieces of the fungus, but with little or no relief. His pains and evacuations continued, almoſt without intermiſſion, till the next night; when he fell into a ſound ſleep, and awaked in the morning perfectly eaſy, and free from complaint."

Many of the different ſpecies of this genus grow on cows or horſes dung, on dunghills, or rotten wood, in cellars, or on the trunks of trees; of which the moſt remarkable is,

9. The quercinus, or agaric of the oak. This is of various ſizes, ſometimes not exceeding the bigneſs of the fiſt, ſometimes as large as a man's head. It takes at leaſt a year or two to grow to its full ſize. It is dark coloured, hard, heavy, and woody; it is ſometimes uſed by the dyers, as an ingredient in the black dye. It taſtes at firſt ſweetiſh in the mouth, but preſently becomes very bitter and nauſeous. It was formerly an article in the Materia Medica; but is now deſervedly rejected from our pharmacopæias.

Culture. Only the eſculent kinds of muſhrooms are cultivated; and the following method is uſed by the gardeners who raiſe them for ſale.—If the young muſhrooms cannot be procured from gardens, they muſt be looked for in rich paſtures during the months of Auguſt and September: the ground muſt be opened about their roots, where it is frequently found full of ſmall white knots; which are the off-ſets, or young muſhrooms. Theſe muſt be carefully gathered in lumps, with the earth about them; but as this ſpawn cannot be found in the paſture, except at that ſeaſon when the muſhroons are naturally produced, it may be ſearched for at any time in old dung-hills, eſpecially where there has been much litter, and it hath not been penetrated by wet ſo as to rot; it may alſo be found very often in old hot-beds; or it may be procured by mixing ſome long dung from the ſtable, which has not been thrown on a heap to ferment, with ſtrong earth, and put under cover to prevent wet getting to it. The ſpawn commonly appears in about two months after the mixture is made; but proportionably ſooner the more effectually the air is excluded, provided the mixture is not kept ſo cloſe as to heat. Old thatch, or litter which has lain long abroad ſo as not to ferment, is the beſt covering. The ſpawn has the appearance of white mould ſhooting out into long ſtrings, by which it may be eaſily known wherever it is met with.—The beds for receiving the ſpawn are now to be prepared. Theſe ſhould be made of dung in which there is plenty of litter, but which ſhould not be thrown on a heap to ferment: that dung which has lain ſpread abroad for a month or longer is beſt. The beds ſhould be made on dry ground, and the dung laid on the ſurface; the width at the bottom ſhould be two and a half or three feet, the length in proportion to the quantity of muſhrooms deſired; then lay the dung about a foot thick, covering it with ſtrong earth about four inches deep. Upon this lay more dung, about ten inches thick; then another layer of earth, ſtill drawing in the ſides of the bed, ſo as to form it like the roof of a houſe; which may be done by three layers of dung, and as many of earth. When the bed is finiſhed, it muſt be covered with litter or old thatch, both to prevent its drying too faſt and to keep out wet. In this ſituation it ought to remain eight or ten days, when it will be in a proper temperature to receive the ſpawn; for this is deſtroyed by too much heat; though, before planting, it may be kept very dry, not only without detriment, but with conſiderable advantage.—The bed being in a proper temperature for the ſpawn, the covering of litter ſhould be taken off, and the ſides of the bed ſmoothed; then a covering of light rich earth, about an inch thick, ſhould be laid all over the bed; but this ſhould not be wet. Upon this the ſpawn muſt be thruſt, laying the lumps two or three inches aſunder: then gently cover this with the ſame light earth, above half an inch thick; and put the covering of litter over the bed, laying it ſo thick as to keep out wet, and prevent the bed from drying. In ſpring or autumn the muſhrooms will begin to appear, perhaps in a month after making; but when the beds are made in ſummer or winter, they are much longer before they produce. In any ſeaſon, however, they ought not to be haſtily deſtroyed; ſince muſhroom-beds have been known to produce very plentifully, even after the ſpawn has lain in them five or ſix months. When the beds are deſtroyed, the ſpawn ſhould be carefully preſerved, and laid up in a dry place, at leaſt five or ſix weeks before it is again planted.—The difficulty of managing muſhroon-beds is to keep them always in a proper degree of moiſture. In the ſummer ſeaſon they may be uncovered to receive gentle ſhowers of rain at proper times; and in long dry ſeaſons the beds ſhould now and then be watered, but much wet ought by no means to be ſuffered to come to them. During the winter ſeaſon they muſt be kept as dry as poſſible, and ſo cloſely covered as to keep out cold. In froſty, or very cold weather, if ſome warm litter, ſhaken out of a dung-heap, is laid on, the growth of the muſhrooms will be promoted: but betwixt this and the bed, a covering of dry litter muſt be interpoſed; which ſhould be renewed as it decays; and, as the cold increaſes, the covering muſt be thickened. By attending to theſe directions, plenty of muſhrooms may be produced all the year round. One bed will continue good for many months. For a peculiar, perhaps fabulous, method of producing muſhrooms, ſee the article LYNCURIUS.

Phyſicians have diſputed much about the qualities of muſhrooms; ſome conſidering them as a rich nouriſhment, and perfectly innocent, when properly choſen; and others aſſerting them to be extremely deleterious. Moſt of the fungi are indeed of a hurtful quality; and, with reſpect to the whole tribe, the eſculent are very few. Eſculent muſhrooms are very nutritive, very readily alkaleſcent, and more ſo without intermediate aceſcency than any other vegetable; they are therefore a rich nouriſhment, and much akin to animal food; on which account they may be indulged in conſiderable quantity to ſtrong perſons. It requires, however, ſkill to diſtinguiſh this eſculent kind; and very few, eſpecially of thoſe who are commonly employed to gather them, viz. the ſervants, have ſtudied Cluſius, or other authors who have been at the pains to diſtinguiſh them. Perhaps eſculent muſhrooms, if old, acquire a dangerous acrimony; and for theſe reaſons Dr Cullen is of opinion that it is for the moſt part prudent to avoid them. In warm climates they may be uſed as light food; but in cold countries it is prepoſterous to uſe them along with animal food, as they do not correct its alkaline tendency.

AGATE, or Achat, (among the Greeks and Latins, Αχατης, and *Achates*, from a river in Sicily, on the banks of which it was firſt found), a very extenſive genus of the ſemipellucid gems.

Thoſe ſtones are variegated with veins and clouds, but have no zones like thoſe of the onyx. They are compoſed of chryſtal debaſed by a large quantity of earth, and not formed, either by repeated incruſtations round a central nucleus, or made up of plates laid evenly on one another; but are merely the effect of one ſimple concretion, and variegated only by the diſpoſition given, by the fluid they were formed in, to their differently coloured veins or matters.

Agates are arranged according to the different colours of their ground. Of thoſe with a *white* ground there are three ſpecies. (1.) The *dendrachetes, mocoa ſtone*, or *aboreſcent agat*. This ſeems to be the ſame with what ſome authors call the achates with roſemary in the middle, and others achates with little branches of black leaves. (2.) The *dull milky-looking agate*. This, though greatly inferior to the former, is yet a very beautiful ſtone. It is common on the ſhores of rivers in the Eaſt Indies, and alſo in Germany and ſome other parts of Europe. Our lapidaries cut it into counters for card-playing, and other toys of ſmall value. (3.) The *lead-coloured agate*, called the *phaſſachates* by the ancients.

Of the agates with a *reddiſh* ground there are four ſpecies. (1.) An impure one of a fleſh-coloured white, which is but of little beauty in compariſon with other agates. The admixture of fleſh-colour is but very ſlight; and it is often found without any clouds, veins, or other variegations; but ſometimes it is prettily veined or variegated with ſpots of irregular figures, having fimbriated edges. It is found in Germany, Italy, and ſome other parts of Europe; and is wrought into toys of ſmall value, and often into the German gunflints. It has been ſometimes found with evident ſpecimens of the perfect moſſes bedded deep in it. (2.) That of the blue blood colour, called *hæmachates*, or the *bloody agate*, by the ancients. (3.) The clouded and ſpotted agate, of a pale fleſh colour, called by the ancients the *carnelian agate*, or *ſardachates*. (4.) The red-lead-coloured one, variegated with yellow, called the *coral agate*, or *coralla-achates*, by the ancients.

Of the agates with a *yellowiſh* ground there are only two known ſpecies; the one of the colour of yellow wax, called *cerachates* by the ancients; the other a very elegant ſtone, of a yellow ground, variegated with white, black, and green, called the *leonina*, and *leonteſeres* by the ancients.

Laſtly, of the agates with a *greeniſh* ground, there is only one known ſpecies, called by the ancients *jaſpachates*.

Of all theſe ſpecies there are a great many varieties; ſome of them having upon them natural repreſentations of men and different kinds of animals, &c. Theſe repreſentations are not confined to the agates whoſe ground is of any particular colour, but are occaſionally found on all the different ſpecies. Velſchius had in his cuſtody a fleſh-coloured agate, on one ſide of which appeared a half-moon in great perfection, repreſented by a milky ſemicircle; on the other ſide, the phaſes of *veſper*, or the evening-ſtar; whence he denominated it an *aphrodiſian agate*. An agate is mentioned by Kircher*, on which was the repreſentation of a heroine armed; and one in the church of St Mark in Venice has the repreſentation of a king's head adorned with a diadem. On another, in the muſæum of the prince of Gonzaga, was repreſented the body of a man with all his clothes, in a running poſture. A ſtill more curious one is mentioned by de Boot †, wherein appears a circle ſtruck in brown, as exactly as if done with a pair of compaſſes, and in the middle of the circle the exact figure of a biſhop with a mitre on: but inverting the ſtone a little, another figure appears; and if it is turned yet further, two others appear, the one of a man and the other of a woman. But the moſt celebrated agate of this kind is that of Pyrrhus, wherein were repreſented the nine muſes, each with their proper attributes, and Apollo in the middle playing on the harp †. In the emperor's cabinet is an oriental agate of a ſurpriſing bigneſs, being faſhioned into a cup, whoſe diameter is an ell, abating two inches. In the cavity is found delineated in black ſpecks, B. XRISTOR. S. XXX. Other agates have alſo been found, repreſenting the numbers 4191, 181; whence they were called *arithmetical* agates, as thoſe repreſenting men or women have obtained the name of *anthropomorphous*.

Great medicinal virtues were formerly attributed to the agate, ſuch as reſiſting poiſons, eſpecially thoſe of the viper, ſcorpion, and ſpider; but they are now very juſtly rejected from medicinal practice. The oriental ones are all ſaid to be brought from the river Gambay. A mine of agates was ſome time ago diſcovered in Tranſylvania, of divers colours; and ſome of a large ſize, weighing ſeveral pounds.

Agates may be ſtained artificially with ſolution of ſilver in ſpirit of nitre, and afterwards expoſing the part to the ſun; and though theſe artificial colours diſappear on laying the ſtone for a night in aquafortis, yet a knowledge of the practicability of thus ſtaining agates, muſt render thoſe curious figures above-mentioned ſtrongly ſuſpected of being the work not of nature, but of art. Some account for theſe phenomena from natural cauſes. Thus, Kircher, who had ſeen a ſtone of this kind in which were depicted the four letters uſually inſcribed on crucifixes, I. N. R. I. apprehends that ſome real crucifix had been buried under-ground, among ſtones and other rubbiſh, where the inſcription happening to be parted from the croſs, and to be received among a ſoft mould or clay ſuſceptible of the impreſſion of the letters, came afterwards to be petrified. In the ſame manner he ſuppoſes the agate of Pyrrhus to have been formed. Others reſolve much of the wonder into fancy, and ſuppoſe thoſe ſtones formed in the ſame manner with the *camieux* * or Florentine ſtones.

The agate is uſed for making cups, rings, ſeals, handles for knives and forks, hilts for ſwords and hangers, beads to pray with, ſmelling boxes, patch-boxes, &c. being cut or ſawed with no great difficulty. At Paris, none have a right to deal in this commodity except the wholeſale mercers and goldſmiths. The ſword-cutlers are allowed to ſell it, but only when made into handles for couteaux de chaſſe, and ready ſet in. The cutlers have the ſame privilege for their knives and forks.

Conſiderable quantities of theſe ſtones are ſtill found near the river Achates in Sicily. There are found in ſome of theſe the ſurpriſing repreſentations above-mentioned, or others ſimilar to them. By a dextrous management of theſe natural ſtains, medals have been produced, which ſeem maſter-pieces of nature: for this ſtone bears the graver well; and as pieces of all magnitudes are found of it, they make all ſorts of work of it. The high altar of the cathedral of Meſſina is all over encruſted with it. The lapidaries pretend that the Indian agates are finer than the Sicilian; but Father Labat* informs us, that in the ſame quarries, and even in the ſame block, there are found pieces much finer than others, and theſe fine pieces are ſold for Indian agates in order to enhance their price.

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* Ephem. German. dec. i. an. 1. obſ. 151.

† De Gem. l. ii. c. 95.

‡ Pliny, l. xxxvii. c. 3.

* See *Camieux.*

Voyage d'Ital. tom. v. p. 156.

Agate, among antiquaries, denotes a ſtone of this kind engraved by art. In this ſenſe, agates make a ſpecies of antique gems; in the workmanſhip whereof we find eminent proofs of the great ſkill and dexterity of the ſculptors. Several agates of exquiſite beauty are preſerved in the cabinets of the curious; but the facts or hiſtories repreſented on theſe antique agates, however well executed, are now become ſo obſcure, and their explications ſo difficult, that ſeveral diverting miſtakes and diſputes have ariſen among thoſe who undertook to give their true meaning.

The great agate of the apotheoſis of Auguſtus, in the treaſury of the holy chapel, when ſent from Conſtantinople to St Lewis, paſſed for a triumph of Joſeph. An agate, now in the French king's cabinet, had been kept 700 years with great devotion, in the Benedictine abbey of St Evre at Toul, where it paſſed for St John the Evangeliſt carried away by an eagle, and crowned by an angel; but the Heatheniſm of it having been lately detected, the religious would no longer give it a place among their relics, but preſented it in 1684 to the king. The antiquaries found it to be the apotheoſis of Germanicus. In like manner the triumph of Joſeph was found to be a repreſentation of Germanicus and Agrippina, under the figures of Ceres and Triptolemus. Another was preſerved, from time immemorial, in one of the moſt ancient churches of France, where it had paſſed for a repreſentation of paradiſe and the fall of man; there being found on it two figures repreſenting Adam and Eve, with a tree, a ſerpent, and a Hebrew inſcription round it, taken from the third chapter of Geneſis, "The woman ſaw that the tree was good," &c. The French academiſts, inſtead of our firſt parents, found Jupiter and Minerva repreſented by the two figures: the inſcription was of a modern date, written in a Rabbinical character, very incorrect, and poorly engraven. The prevailing opinion was, that this agate repreſented ſimply the worſhip of Jupiter and Minerva at Athens.

Hiſt. Acad. R. Inſcript. tom. i. p. 337,—344.

Agate, is alſo a name of an inſtrument uſed by gold-wire-drawers; ſo called from the agate in the middle of it, which forms its principal part.

AGATHIAS, or, as he calls himſelf in his epigrams, Agathius, diſtinguiſhed by the title of *Scholaſticus*, a Greek hiſtorian in the 16th century under Juſtinian. He was born at Myrina, a colony of the ancient Æolians, in Aſia the leſs, at the mouth of the river Phythicus. He was an advocate at Smyrna. Tho' he had a taſte for poetry, he was yet more famous for his hiſtory, which begins with the 26th year of Juſtinian's reign, where Procopius ends. It was printed in Greek and Latin, with Bonaventure Vulcanius's, at Leyden, 1595, in 4to; and in Paris at the king's printing-houſe, 1660, in folio.

AGATHO, a tragic and comic poet, diſciple to Prodicus and Socrates, applauded in Plato's Dialogues for his virtue and beauty. His firſt tragedy obtained the prize; and he was crowned in the preſence of upwards of 30,000 men, the 4th year of the 90th Olympiad. There is nothing now extant of his except a few quotations in Ariſtotle, Athenæus, and others.

AGATHOCLES, the famous tyrant of Sicily, was ſon of a potter at Reggio. He was a thief, a common ſoldier, a centurion, a general, and a pirate, all in a regular ſucceſſion. He defeated the Carthaginians ſeveral times in Sicily, and was once defeated himſelf. He firſt made himſelf tyrant of Syracuſe, and then of all Sicily; after which, he vanquiſhed the Carthaginians again both in Sicily and Africa. But at length having ill ſucceſs, and being in arrears with his ſoldiers, they mutinied, forced him to fly his camp, and cut the throats of his children, whom he left behind. Recovering himſelf again, he relieved Corfou, beſieged by Caſſander; burnt the Macedonian fleet; returned to Sicily; murdered the wives and children of thoſe who had murdered his; afterwards meeting with the ſoldiers themſelves, he put them all to the ſword; and ravaging the ſea-coaſt of Italy, took the city of Hipponium. He was at length poiſoned by his grandſon Archagathus, in the 72d year of his age, 290 years before Chriſt, having reigned 28 years.

AGATHYRNA, or Agathyrnum, Agathyrsa, or Agathyrsum, (anc. geog.) a town of Sicily; now *S. Marco*; as old as the war of Troy, being built by Agathyrnus, ſon of Æolus, on an eminence. The gentilitious name is *Agathyrnæus*; or, according to the Roman idiom, *Agathyrnenſis*.

AGAVE, the common American aloe: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: There is no *calyx*: The *corolla* is monopetulous and funnel-ſhaped; the border ſix-parted, with lanced erect diviſions: The *ſtamina* conſiſt of ſix erect filaments, longer than the corolla; the antheræ are linear, ſhorter than the filaments, and verſatile: The *piſtillum* is an oblong germen; the ſtylus is filiform, the length of the ſtamina, and triangular; the ſtigma headed and triangular: The *pericarpium* is an oblong triangular capſule, trilocular and three-valved: The *ſeeds* are numerous. Of this genus, botanical writers enumerate eight ſpecies.

Of the Americana, or great American aloe, the ſtems generally riſe upwards of 20 feet high, and branch out on every ſide towards the top, ſo as to form a kind of pyramid: the ſlender ſhoots being garniſhed with greeniſh yellow flowers, which ſtand erect, and come out in thick cluſters at every joint: theſe make a fine appearance, and continue long in beauty; a ſucceſſion of new flowers being produced for near three months in favourable ſeaſons, if the plant is protected from the autumnal colds. The ſeeds do not ripen in England. It has been generally thought, that theſe plants do not flower till they are 100 years old: but this is a miſtake; for the time of their flowering depends on their growth: ſo that in hot countries, where they grow faſt, and expand many leaves every ſeaſon, they will flower in a few years; but in colder climates, where their growth is ſlow, it will be much longer before they ſhoot up their ſtem. There is a variety of this ſpecies with ſtriped leaves, which are pretty common in the Engliſh gardens. The other ſorts are ſo tender, that they muſt conſtantly remain in the ſtove.

ADGE, a city of France, in Lower Languedoc, in the territory of Agadez, with a biſhop's ſee. The dioceſe is ſmall, but is one of the richeſt countries in the kingdom. It produces fine wool, wine, oil, corn, and ſilk. It is ſeated on the river Eraut, a mile and a quarter from its mouth, where it falls into the gulph of Lyons, and where there is a fort built to guard its entrance. It is well peopled; the houſes are built of black ſtone, and there is an entrance into the city by four gates. The greateſt part of the inhabitants are merchants or ſeamen. The public buildings are but mean: the cathedral is ſmall, and not very handſome: the biſhop's palace is an old building, but convenient. The city is extended along the river, where it forms a little port wherein ſmall craft may enter. There is a great concourſe of pilgrims and other devout people to the chapel of Notre Dame de Grace. It is a little without the city, between which and the chapel there are about 13 or 14 oratories, which they viſit with naked feet. The convent of the Capuchins is well built, and on the outſide are lodgings and apartments for the pilgrims who come to perform their *neuvaine* or nine days devotion. The chapel, which contains the image of the Virgin Mary, is diſtinct from the convent. E. Long. 3. 20. Lat. 43. 19.

AGE, in the moſt general ſenſe of the word, ſignifies the duration of any being, from its firſt coming into exiſtence to the time of ſpeaking of it, if it ſtill continues; or to its deſtruction, if it has ceaſed to exiſt ſome time before we happen to mention it.

Among the ancient poets, this word was uſed for the ſpace of thirty years; in which ſenſe *age* amounts to much the ſame with *generation*. Thus, Neſtor is ſaid to have lived *three ages* when he was 90 years old.—By ancient Greek hiſtorians, the time elapſed ſince the beginning of the world is divided into three periods, which they call *ages*. The firſt reaches from the creation to the deluge which happened in Greece during the reign of Ogyges; this they called the *obſcure* or *uncertain* age, becauſe the hiſtory of mankind is altogether uncertain during that period. The ſecond they call the *fabulous* or *heroic* age, becauſe it is the period in which the fabulous exploits of their gods and heroes are ſaid to have been performed. It began with the Ogygian deluge, and continued to the firſt Olympiad; where the third or *hiſtorical* age commenced.—This diviſion, however, it muſt be obſerved, holds good only with regard to the Greeks and Romans, who had no hiſtories earlier than the firſt Olympiad; the Jews, Egyptians, Phenicians, and Chaldees, not to mention the Indians and Chineſe, who pretend to much higher antiquity, are not included in it.

The interval ſince the firſt formation of man has been divided by the poets into four *ages*, diſtinguiſhed by the epithets of *golden*, *ſilver*, *brazen*, and *iron*. During the *golden* age, Saturn reigned in heaven, and juſtice and innocence in this lower world. The earth then yielded her productions without culture; men held all things in common, and lived in perfect friendſhip. This period is ſuppoſed to have laſted till the expulſion of Saturn from his kingdom. The *ſilver* age commenced when men began to deviate from the paths of virtue; and in conſequence of this deviation, their lives became leſs happy. The *brazen* age commenced on a further deviation, and the *iron* age took place in conſequence of one ſtill greater.—A late author, however, reflecting on the barbariſm of the firſt ages, will have the order which the poets aſſign to the four ages inverted; the firſt being a time of rudeneſs and ignorance, more properly denominated an *iron* than a *golden* age. When cities and ſtates were founded, the *ſilver* age commenced; and ſince arts and ſciences, navigation and commerce, have been cultivated, the *golden* age has taken place.

In ſome ancient northern monuments, the *rocky* or *ſtony* age correſponds to the *brazen* age of the Greeks. It is called *rocky*, on account of Noah's ark, which reſted on mount Ararat; whence men were ſaid to be deſcended or ſprung from mountains: or from Deucalion and Pyrrha reſtoring the race of mankind, by throwing ſtones over their heads. The northern poets alſo ſtyle the fourth age of the world the *aſhen* age, from a Gothic king Madenis, or Mannus, who on account of his great ſtrength was ſaid to be made of aſh, or becauſe in his time people began to make uſe of weapons made of that wood.

Among the Jews, the duration of the world is alſo divided into three ages. 1. The *ſeculum inane*, or *void age*, was the ſpace of time from the creation to Moſes. 2. The *preſent* age, denotes all the ſpace of time from Moſes to the coming of the Meſſiah; and, 3. The *age to come*, denotes the time from the coming of the Meſſiah to the end of the world.

Various other diviſions of the duration of the world into *ages* have been made by hiſtorians.—The Sibylline oracles, wrote, according to ſome, by Jews acquainted with the prophecies of the Old Teſtament, divide the duration of the world into ten *ages*; and according to Joſephus, each age contained ſix hundred years. It appears by Virgil's fourth eclogue, and other teſtimonies, that the age of Auguſtus was reputed the end of thoſe ten *ages*, conſequently as the period of the world's duration.

By ſome, the ſpace of time commencing from Conſtantine, and ending with the taking of Conſtantinople by the Turks in the 15th century, is called the *middle age*: but others chooſe rather to date the middle age from the diviſion of the empire made by Theodoſius at the cloſe of the 4th century, and extend it to the time of the emperor Maximilian I. in the beginning of the 16th century, when the empire was firſt divided into circles.—The *middle* is by ſome denoted the *barbarous* age, and the latter part of it the *loweſt* age. Some divide it into the *non-academical* and *academical* ages. The firſt includes the ſpace of time from the 6th to the 9th centuries, during which ſchools or academies were loſt in Europe. The ſecond from the 9th century, when ſchools were reſtored, and univerſities eſtabliſhed, chiefly by the care of Charlemagne.

The ſeveral *ages* of the world may be reduced to three grand epochas, *viz*. the *age* of the law of nature, called by the Jews the *void age*, from Adam to Moſes; the *age* of the Jewiſh law, from Moſes to Chriſt; and the *age* of grace, from Chriſt to the preſent year.

Age is alſo frequently uſed in the ſame ſenſe with *century*, to denominate a duration of 100 years.

Age likewiſe ſignifies a certain period of the duration of human life: by ſome divided into four ſtages, namely, infancy, youth, manhood, and old age; the firſt extending to the 14th year, the ſecond to the 25th, the third to the 50th, and the fourth to the end of life: by others divided into infancy, childhood, youth, manhood, and old age.

Age, in law, ſignifies a certain period of life, when perſons of both ſexes are enabled to do certain acts. Thus, one at twelve years of age ought to take the oath of allegiance to the king in a leet; at fourteen he may marry, chuſe his guardian, and claim his lands held in ſoccage. Twenty-one is called *full age*, a man or woman being then capable of acting for themſelves, of managing their affairs, making contracts, diſpoſing of their eſtates, and the like.

Age of a Horſe. See Horse.

Age of Trees. Theſe after a certain age waſte. An oak at an hundred years old ceaſes to grow. The uſual rule for judging of the *age* of wood, is by the number of circles which appear in the ſubſtance of a trunk or ſtock cut perpendicularly, each circle being ſuppoſed the growth of a year: though ſome reject this method as precarious, alleging, that a ſimple circle is ſometimes the produce of ſeveral years; beſides that, after a certain age, no new circles are formed.

Age-prier, in law, is when an action being brought againſt a perſon under age, for lands deſcended to him, he, by motion or petition, ſhews the matter to the court, praying the action may be ſtaid till his full age, which the court generally agrees to.

AGELNOTH, Egelnoth, or Æthelnoth, in Latin *Achelnotus*, archbiſhop of Canterbury, in the reign of Canute the Great, ſucceeded Livingus in that ſee in the year 1020. This prelate, ſirnamed the *Good*, was ſon of earl Agilmer, and, at the time of his election, dean of Canterbury. After his promotion he went to Rome, and received his pall from Pope Benedict VIII. In his way thither, as he paſſed through Pavia, he purchaſed, for an hundred talents of ſilver and one of gold, St Auguſtin's arm, which was kept there as a relic; and ſent it over to England as a preſent to Leofric earl of Coventry. Upon his return, he is ſaid to have raiſed the ſee of Canterbury to its former luſtre. He was much in favour with king Canute, and employed his intereſt with that monarch to good purpoſes. It was by his advice the king ſent over large ſums of money for the ſupport of the foreign churches; and Malmſbury obſerves, that this prince was prompted to acts of piety, and reſtrained from exceſſes, by the regard he had for the archbiſhop. Agelnoth, after he had ſat 17 years in the ſee of Canterbury, departed this life the 29th of October 1038, and was ſucceeded by Eadſius, king Harold's chaplain.—This archbiſhop was an author, having written, 1. A Panegyric on the bleſſed Virgin Mary. 2. A Letter to Earl Leofric concerning St Auguſtin. 3. Letters to ſeveral perſons.

AGEMA, in Macedonian antiquity, was a body of ſoldiery, not unlike the Roman legion.

AGEMOGLANS, Agiamoglans, or Azamoglans, in the Turkiſh polity, are children purchaſed from the Tartars, or raiſed every third year, by way of tribute, from the Chriſtians tolerated in the Turkiſh empire. Theſe, after being circumciſed and inſtructed in the religion and language of their tyrannical maſters, are learnt the exerciſes of war, till they are of a proper age for carrying arms; and from this corps the Janiſſaries are recruited. With regard to thoſe who are thought unfit for the army, they are employed in the loweſt offices of the ſeraglio. Their appointments alſo are very ſmall, not exceeding ſeven aſpers and a half per day, which amount to about threepence-halfpenny ſterling.

AGEN, a city of France, on the river Garonne, the capital of Agenois in Guienna, and the ſee of a biſhop. The gates and old walls, which are yet remaining, ſhow that this city is very ancient, and that its former circuit was not ſo great as the preſent. The palace, wherein the preſidial holds his ſeſſions at this day, was heretofore called the caſtle of Montravel, and is ſeated without the walls of the old city, and on the ſide of the foſſe. There are likewiſe the ruins of another caſtle called *La Sagne*, which was without the walls cloſe by a brook. Though the ſituation of Agen is very convenient for trade and commerce, the inhabitants are ſo very indolent that there is very little; of which their neighbouring cities take the advantage. It is ſeated on the bank of the river Garonne, in a pleaſant country, but is itſelf a very mean and diſagreeable place, the houſes being ill built, and the ſtreets narrow, crooked and dirty. E. Long. 0.30. N. Lat. 44. 12.

AGENDA, among philoſophers and divines, ſignifies the duties which a man lies under an obligation to perform: thus, we meet with the *agenda* of a Chriſtian, or the duties he ought to perform; in oppoſition to the *credenda*, or things he is to believe.

Agenda, among merchants, a term ſometimes uſed for a memorandum-book, in which is ſet down all the buſineſs to be tranſacted during the day, either at home or abroad.

Agenda, among eccleſiaſtical writers, denotes the ſervice or office of the church. We meet with *agenda matutina & veſpertina*, "morning and evening prayers;" *agenda diei*, "the office of the day," whether feaſt or faſt day; *agenda mortuorum*, called alſo ſimply *agenda*, "the ſervice of the dead."

Agenda, is alſo applied to certain church-books, compiled by public authority, preſcribing the order and manner to be obſerved by the miniſters and people in the principal ceremonies and devotions of the church. In which ſenſe, *agenda* amounts to the ſame with what is otherwiſe called *ritual, liturgy, acalouthia, miſſal, formulary, directory*, &c.

AGENHINE, in old writers, ſignifies a gueſt that has lodged at an inn for three nights, after which time he was accounted one of the family; and if he offended the king's peace, his hoſt was anſwerable for him. It is alſo written hogenhine and hogenhyne.

AGENORIA, in mythology, the goddeſs of courage and induſtry, as *Vacuna* was of indolence.

AGENT, in a general ſenſe, denotes any active power or cauſe. Agents are either natural or moral. Natural agents are ſuch inanimate bodies as have a power to act upon other bodies in a certain and determinate manner; as, gravity, fire, &c. Moral agents on the contrary, are rational creatures, capable of regulating their actions by a certain rule.

Agent, is alſo uſed to denote a perſon intruſted with the management of an affair, whether belonging to a ſociety, company, or private perſon.

Agentes in rebus, one of the ranks of officers in the court of the Conſtantinopolitan emperors, whoſe buſineſs was to collect and convey the corn both for the army and houſehold; to carry letters and meſſages from court to all parts of the empire; to regulate couriers, and their vehicles; to make frequent journeys and expeditions through the provinces, in order to inſpect any motions, diſturbances, or machinations tending that way, and to give early notice thereof to the emperor.

The *agentes in rebus*, are by ſome made ſynonymous with our poſt-maſters, but their functions were of great extent. They correſpond to what the Greeks call ϖυροφοροι, and the Latins *veredarii*.

There were various orders or degrees of *agentes in rebus*; as, *tribuni*, *primicerii*, *ſenatores*, *ducenarii*, *biarchi*, *circitores*, *equites*, *tyrones*, &c. through all which they roſe *gradatim*. Their chief, who reſided at Conſtantinople, was denominated *princeps*; which was a poſt of great dignity, being reckoned on a level with that of proconſul. They were ſettled in every part of the empire; and are alſo ſaid to have ſerved as interpreters.

AGER, in Roman antiquity, a certain portion of land allowed to each citizen. See Agrarian Law.

AGER PICENUS, or *Picenum*, (anc. geog.) a territory of Italy to the ſouth-eaſt of Umbria, reaching from the Apennine to the Adriatic. The people are called *Picentes* (Cicero, Livy), diſtinct from the Picentini on the Tuſcan ſea, though called by Greek writers Πικεντινοι. This name is ſaid to be from the bird *Picus*, under whoſe conduct they removed from the Sabines, of whom they were a colony.

AGERATUM, BASTARD-HEMP-AGRIMONY: A genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ diſcoides*. The characters are: The common *calyx* is oblong, with many ſcales. The compound *corolla* is uniform; the corollets hermaphrodite, tubular, and numerous: the proper corolla is funnel-ſhaped; the border 4-cleft, and expanded. The *ſtamina* conſiſt of 5 capillary very ſhort filaments; the anthera is cylindric and tubular. The *piſtillum* is an oblong germen; with a filiform ſtylus, and two ſlender erect ſtigmata. There is no *pericarpium*; the *calyx* unchanged. The *ſeeds* are ſolitary, oblong, and angular. The *receptaculum* is naked, convex, and very ſmall. Of this genus there are three. *Species*: the conyzoides, the houſtonianum, and the altiſſimum. All theſe are natives of warm climates. The two firſt are annual plants, and conſequently can be propagated only by ſeeds; which, however, come to perfection in England. The third ſpecies will bear the ſevereſt cold of Britain, but its ſeeds do not ripen in it.

Ageratum, or Maudlin. See Achillæa.

AGESILAUS, king of the Lacedæmonians, the ſon of Archidamus, was raiſed to the throne notwithſtanding the ſuperior claim of Leotychides. As ſoon as he came to the throne, he adviſed the Lacedæmonians to be beforehand with the king of Perſia, who was making great preparations for war, and to attack him in his own dominions. He was himſelf choſen for this expedition; and gained ſo many advantages over the enemy, that if the league which the Athenians and the Thebans formed againſt the Lacedæmonians had not obliged him to return home, he would have carried his victorious arms into the very heart of the Perſian empire. He gave up, however, all theſe triumphs readily, to come to the ſuccour of his country, which he happily relieved by his victory over the allies in Bœotia. He obtained another near Corinth; but to his great mortification, the Thebans afterwards gained ſeveral over the Lacedæmonians. Theſe misfortunes at firſt raiſed ſomewhat of a clamour againſt him. He had been ſick during the firſt advantages which the enemy gained; but as ſoon as he was able to act in perſon, by his valour and prudence he prevented the Thebans from reaping the advantages of their victories; inſomuch that it was generally believed, had he been in health at the beginning, the Lacedæmonians would have ſuſtained no loſſes, and that all would have been loſt had it not been for his aſſiſtance. It cannot be denied but he loved war more than the intereſt of his country required; for if he could have lived in peace, he had ſaved the Lacedæmonians ſeveral loſſes, and they would not have been engaged in many enterpriſes which in the end contributed much to weaken their power. He died in the third year of the 104th Olympiad, being the 84th year of his age, and 41ſt year of his reign. Ageſilaus would never ſuffer any picture or ſculpture to be made of him, and prohibited it alſo by his will: this he is ſuppoſed to have done from a conſciouſneſs of his own deformity; for he was of a ſhort ſtature, and lame of one foot, ſo that ſtrangers uſed to deſpiſe him at the firſt ſight. His fame went before him in Egypt, and there they had formed the higheſt idea of Ageſilaus. When he landed in that country, the people ran in crowds to ſee him: but great was their ſurpriſe when they ſaw an ill-dreſſed, ſlovenly, mean-looking little fellow lying upon the graſs; they could not forbear laughing, and applied to him the fable of the mountain in labour. He was, however, the firſt to jeſt upon his own perſon; and ſuch was the gaiety of his temper, and the ſtrength with which he bore the roughest exerciſes, that theſe qualities made amends for his corporal defects. He was extremely remarkable for plainneſs and frugality in his dreſs and way of living. "This (ſays Cornelius Nepos) is eſpecially to be admired in Ageſilaus: when very great preſents were ſent him by kings, governors, and ſtates, he never brought any of them to his own houſe; he changed nothing of the diet, nothing of the apparel of the Lacedæmonians. He was contented with the ſame houſe in which Euriſthenes, the founder of his family, had lived: and whoever entered there, could ſee no ſign of debauchery, none of luxury; but on the contrary, many of moderation and abſtinence; for it was furniſhed in ſuch a manner, that it differed in nothing from that of any poor or private perſon." Upon his arrival in Egypt, all kinds of proviſions were ſent to him; but he choſe only the moſt common, leaving the perfumes, the confections, and all that was eſteemed moſt delicious, to his ſervants. Ageſilaus was extremely fond of his children, and would often amuſe himſelf by joining in their diverſions: one day when he was ſurpriſed riding upon a ſtick with them, he ſaid to the perſon who had ſeen him in this poſture, "Forbear talking of it till you are a father."

AGGA, or AGGONNA, a Britiſh ſettlement on the gold-coaſt of Guinea. It is ſituated under the meridian of London, in 6 degrees of N. Lat.

AGGER, in the ancient military art, a work of fortification, uſed both for the defence and the attack of towns, camps, &c. In which ſenſe it is the ſame with what was otherwiſe called *vallum*, and in later times *aggeſtum*; and among the moderns *lines*, ſometimes *cavaliers*, *terraſſes*, &c. The agger was uſually a bank, or elevation of earth or other matter, bound and ſupported with timber; having ſometimes turrets on the top, wherein the workmen, engineers, and ſoldiery, were placed. It was alſo accompanied with a ditch, which ſerved as its chief defence. The uſual materials of which it was made were earth, boughs, faſcines, ſtakes, and even trunks of trees, ropes, &c. variouſly croſſed, and interwoven ſomewhat in the figure of ſtars; whence they were called *ſtellati axes*. Where theſe were wanting, ſtones, bricks, tiles, ſupplied the office; on ſome occaſions, arms, utenſils, pack-ſaddles, were thrown in to fill it up. We even read of aggers formed of the carcaſes of the ſlain; ſometimes of dead bones mixed with lime; and even with the heads of ſlaughtered citizens. For want of due binding, or ſolid materials, aggers have ſometimes tumbled down, with infinite miſchief to the men. The beſiegers uſed to carry on a work of this kind nearer and nearer towards the place, till at length they reached the very wall. The methods taken, on the other ſide, to defeat them, were by fire, eſpecially if the agger were of wood; by ſapping and undermining, if of earth; and, in ſome caſes, by erecting a counter agger.

The height of the agger was frequently equal to that of the wall of the place. Cæſar tells of one he made, that was 30 feet high and 330 feet broad. Beſides the uſe of aggers before towns, the generals uſed to fortify their camps with ſuch works; for want of this precaution, armies have often been ſurpriſed and ruined.

There were vaſt aggers made in towns and places on the ſea-ſide, fortified with towers, caſtles, &c. Thoſe made by Cæſar and Pompey at Brunduſium, are famous. Sometimes aggers were even built acroſs arms of the ſea, lakes, and moraſſes; as was done by Alexander before Tyre, and by M. Anthony and Caſſius.—The wall of Severus in the north of England, may be conſidered as a grand agger, to which belong ſeveral leſſer ones. See SEVERUS's *Wall*.

AGGER, in ancient writers, likewiſe denotes the middle part of a military road, raiſed into a ridge, with a gentle ſlope on either ſide, to make a drain for the water, and keep the way dry.

The term is alſo uſed for the whole road, or military way. Where highways were to be made in low grounds as between two hills, the Romans uſed to raiſe them above the adjacent land, ſo as to make them of a level with the hills. Theſe banks they called *aggeres*. Bergier mentions ſeveral in Gallia Belgica, which were thus raiſed ten, fifteen, or twenty feet above ground. —They are ſometimes alſo called *aggeres calceati*; and now generally known by the name *chauſſees*, or *cauſeways*.

AGGERHUYS, a city of Norway, capital of the province of the ſame name. It is ſubject to Denmark, and ſituated in E. Long. 28. 35. and N. Lat. 59. 30.

AGGERS-HERRED, a diſtrict of Chriſtianſand and a dioceſe of Norway. It conſiſts of three juridical places; namely, Aſcher, Weſt Barum, and Ager.

AGGLUTINANTS, in pharmacy, a general name for all medicines of a glutinous or viſcid nature: which, by adhering to the ſolids, contribute greatly to repair their loſs.

AGGLUTINATION, in a general ſenſe, denotes the joining two or more things together, by means of proper glue or cement.

AGGLUTINATION, among phyſicians, implies the action of reuniting the parts of a body, ſeparated by a wound, cut, &c. It is alſo applied to the action of ſuch internal medicines as are of an agglutinating quality, and which, by giving a glutinous conſiſtence to the animal-fluids, render them more proper for nouriſhing the body.

AGGREGATE, in a general ſenſe, denotes the ſum of ſeveral things added together, or the collection of them into one whole. Thus, a houſe is an aggregate of ſtones, wood, mortar, &c. It differs from a mixed or compound, inaſmuch as the union of theſe laſt is more intimate than between the parts of an aggregate.

AGGREGATE, in botany, is a term uſed to expreſs thoſe flowers, which are compoſed of parts or florets, ſo united by means either of the receptacle or calyx, that no one of them can be taken away without deſtroying the form of the whole. They are oppoſed to ſimple flowers, which have no ſuch common part, and are uſually divided into ſeven kinds, viz. the *aggregate* properly ſo called, whoſe receptacle is dilated, and whoſe florets are ſupported by foot-ſtalks; ſuch are the blue daiſy, thrift, or ſea-pink, &c.; the *compound*; the *umbellati*; the *cymoſe*; the *amentaceous*; the *glumoſe*; and the *ſpadiceous*.

AGGREGATION, in phyſics, a ſpecies of union whereby ſeveral things which have no natural dependence or connection with one another are collected together, ſo as in ſome ſenſe to conſtitute one. Thus a heap of ſand, or a maſs of ruins, are bodies by aggregation.

AGHER, a town of Ireland, which ſends two members to parliament. It is ſituated in the ſouthern part of Ulſter, not far from Clogher.

AGHRIM, a town of Ireland, in the county of Wicklow, and province of Leinſter, ſituated about 13 miles ſouth-weſt of Wicklow.

AGHRIM, in Galway; a ſmall village, diſtant about 21 miles from Dublin, and rendered memorable by a deciſive battle fought there, and at Kilcommodon-hill, the 12th of July 1691, between general Ginckle and Monſieur St Ruth, the commanders under king William III. and James II. when St Ruth, the general of the Iriſh army, with 7000 of his men, were ſlain; but of the Engliſh only 600. The victory was the more conſiderable, as the Engliſh army conſiſted of no more than 18,000 men; whereas the Iriſh were computed at 20,000 foot and 5000 horſe and dragoons. They loſt likewiſe nine pieces of braſs cannon; all their ammunition,

tion, tents, and baggage; moſt of their ſmall arms, which they threw away to expedite their flight; with 11 ſtandards, and 32 pair of colours.

AGIADES, in the Turkiſh armies, a kind of pioneers employed in fortifying camps, ſmoothing of roads, and the like offices.

AGILITY, an aptitude of the ſeveral parts of the body to motion.—The improving of agility was one of the chief objects of the inſtitution of games and exerciſes. The athletæ made particular profeſſion of the ſcience of cultivating and improving agility. Agility of body is often ſuppoſed peculiar to ſome people; yet it ſeems leſs owing to any thing peculiar, in their frame and ſtructure, than to practice.

AGINCOURT, a village in the French Netherlands, ſituated in E. Long. 2. 10. N. Lat. 50. 35.; famous on account of the victory obtained by Henry V. of England over the French, in 1415.

The army of Henry, after landing in France, was by various accidents reduced to 10,000 men, of whom not a few were ſick, or ſlowly recovering from ſickneſs;—they had to traverſe a long tract of country, inhabited by exaſperated enemies, from whom they were to procure proviſions, lodgings, guides, intelligence, and every thing they wanted;—that country was defended by many ſtrong towns, interſected with deep rivers, and guarded by an army of 100,000, or (according to ſome contemporary writers) 140,000 men.

Henry, undaunted by all theſe dangers and difficulties, departed from Harfleur, marching his army in three lines, with bodies of cavalry on the wings. He proceeded by very eaſy journeys, that he might not fatigue his troops, or diſcourage them by the appearance of a flight; obſerving the ſtricteſt diſcipline, and paying generouſly for every thing he received; which induced the country people to bring proviſions to his camp, in ſpite of all the commands they had received to the contrary. To keep his men in ſpirits, and from repining, the king fared as ill as the meaneſt ſoldier, always appearing with a chearful countenance, and addreſſing them in the moſt friendly and encouraging language. They arrived at the village of Agincourt, in the county of St Pol, on the evening of October 24th; and there beheld the whole French army, at a ſmall diſtance, directly in their route. The king took an attentive view of it from an eminence; and being fully convinced that it was impoſſible to proceed any farther on his way to Calais without a battle, and equally impoſſible to return to Harfleur with ſo great an army in his rear, he reſolved to hazard an action next morning, as the only means of preſerving himſelf and his little army from deſtruction.

The Engliſh army lodged that night in the villages of Agincourt, Maiſoncelle, and ſome others; where they met with better accommodation than they had been accuſtomed to for ſome time paſt, and ſpent part of their time in mutual exhortations to fight bravely in the approaching battle. The king, overhearing ſome of his nobles expreſſing a wiſh that the many brave men who were idle in England were preſent to aſſiſt them, is ſaid to have cried out—“ No! I would not have one man more:—if we are defeated, we are too many—if it ſhall pleaſe God to give us the victory, as I truſt he will, the ſmaller our number the greater our glory.” The moon happening to ſhine very bright, Henry, with ſome of his beſt officers, carefully examined the ground, and pitched upon a field of battle, admirably calculated to preſerve a ſmall army from being ſurrounded by a great one. It was a gentle declivity from the village of Agincourt, of ſufficient extent for his ſmall army, defended on each ſide by hedges, trees, and bruſhwood. Having placed guards and kindled fires on all ſides, the king and his army betook themſelves to reſt; except ſuch as were of a more ſerious turn of mind, and, conſidering that as the laſt night of their lives, ſpent it in devotion.

The French, exulting in their numbers, confident of victory, and abounding in proviſions, ſpent the night in noiſy feſtivity, and in forming fanciful ſchemes about the diſpoſal of their priſoners and their booty. It was in general reſolved to put all the Engliſh to the ſword, except the king and the chief nobility, who were to be taken priſoners for the ſake of their ranſoms.

On the morning of Friday, the memorable 25th of October, A. D. 1415, the day of Criſpin and Criſpianus, the Engliſh and French armies were ranged in order of battle, each in three lines, with bodies of cavalry on each wing. The Conſtable D’Albert, who commanded the French army, fell into the ſnare that was laid for him, by drawing up his army in the narrow plain between the two woods. This deprived him, in a great meaſure, of the advantage he ſhould have derived from the prodigious ſuperiority of his numbers; obliged him to make his lines unneceſſarily deep, about 30 men in file; to crowd his troops, particularly his cavalry, ſo cloſe together, that they could hardly move or uſe their arms: and, in a word, was the chief cauſe of all the diſaſters that followed. The French, it is ſaid, had a conſiderable number of cannon of different ſizes in the field; but we do not hear that they did any execution, probably for want of room. The firſt line of the French army, which conſiſted of 8000 men-at-arms on foot mixed with 4000 archers, with 500 men-at-arms mounted on each wing, was commanded by the Conſtable D’Albert, the dukes of Orleans and Bourbon, and many other nobles; the dukes of Alençon, Brabant, and Bar, &c. conducted the ſecond line; and the earls of Marle, Damartine, Fauconberg, &c. were at the head of the third line. The king of England employed various arts to ſupply his defect of numbers. He placed 200 of his beſt archers in ambuſh, in a low meadow, on the flank of the firſt line of the French. His own firſt line conſiſted wholly of archers, four in file; each of whom, beſides his bow and arrows, had a battle axe, a ſword, and a ſtake pointed with iron at both ends, which he fixed before him in the ground, the point inclining outwards, to protect him from cavalry; which was a new invention, and had a happy effect. That he might not be encumbered, he diſmiſſed all his priſoners, on their word of honour to ſurrender themſelves at Calais, if he obtained the victory; and lodged all his baggage in the village of Agincourt, in his rear, under a ſlender guard. The command of the firſt line was, at his earneſt requeſt, committed to Edward duke of York, aſſiſted by the lords Beaumont, Willoughby, and Fanhope; the ſecond was conducted by the king, with his youngeſt brother Humphry duke of Glouceſter, the earls of Oxford, Marſhal, and Suffolk; and the third was led by the

Agincourt.

duke of Exeter, the king's uncle. The lines being formed, the king, in ſhining armour, with a crown of gold adorned with precious ſtones on his helmet, mounted on a fine white horſe, rode along them, and addreſſed each corps with a chearful countenance, and animating ſpeeches. To inflame their reſentment againſt their enemies, he told them, that the French had determined to cut off three fingers of the right hand of every priſoner; and to rouſe their love of honour, he declared, that every ſoldier in that army who behaved well, ſhould from henceforth be deemed a gentleman, and be intitled to bear coat-armour.

When the two armies were drawn up in this manner, they ſtood a conſiderable time gazing at one another in ſolemn ſilence. But the king, dreading that the French would diſcover the danger of their ſituation and decline a battle, commanded the charge to be ſounded, about ten o'clock in the forenoon. At that inſtant, the firſt line of the Engliſh kneeled down, and kiſſed the ground; and then ſtarting up, diſcharged a flight of arrows, which did great execution among the crowded ranks of the French. Immediately after, upon a ſignal being given, the archers in ambuſh aroſe, and diſcharged their arrows on the flank of the French line, and threw it into ſome diſorder. The battle now became general, and raged with uncommon fury. The Engliſh archers, having expended all their arrows, threw away their bows, and ruſhing forward, made dreadful havoc with their ſwords and battle-axes. The firſt line of the enemy was, by theſe means, defeated; its leaders being either killed or taken priſoners. The ſecond line, commanded by the duke D'Alençon, (who had made a vow either to kill or take the king of England, or to periſh in the attempt), now advanced to the charge, and was encountered by the ſecond line of the Engliſh, conducted by the king. This conflict was more cloſe and furious than the former. The duke of Glouceſter, wounded and unhorſed, was protected by his royal brother till he was carried off the field. The duke D'Alençon forced his way to the king, and aſſaulted him with great fury; but that prince brought him to the ground, where he was inſtantly diſpatched. Diſcouraged by this diſaſter, the ſecond line made no more reſiſtance; and the third fled without ſtriking a blow; yielding a complete and glorious victory to the Engliſh, after a violent ſtruggle of three hours duration.

The king did not permit his men to purſue the fugitives to a great diſtance, but encouraged them to take as many priſoners as they could on or near the field; in which they were ſo ſucceſsful, that, in a little time, his captives were more numerous than his ſoldiers. A great proportion of theſe priſoners were men of rank and fortune; for many of the French nobleſſe being on foot, and loaded with their heavy armour, could not make their eſcape. Among theſe were the dukes of Orleans and Bourbon, the marſhal Boucicaut, the counts D'Eu, Vendome, Richemont, and Harcourt, and 7000 barons, knights, and gentlemen. The French left dead on the field of battle, the conſtable D'Albert, the three dukes of Alençon, Brabant, and Bar, the archbiſhop of Sens, one marſhal, 13 earls, 92 barons, 1500 knights, and a far greater number of gentlemen, beſides ſeveral thouſands of common ſoldiers. Even the French hiſtorians acknowledge, that the loſs of the Engliſh was inconſiderable: thoſe of Engliſh contemporary writers who make it the greateſt, affirm, that it did not exceed 100, and that the duke of York and the earl of Suffolk were the only great men who fell on that ſide in this memorable action.

Agio, ‖ Agis.

AGIO, in commerce, is a term chiefly uſed in Holland, and at Venice, to ſignify the difference between the value of bank-ſtock and the current coin. The agio in Holland is generally three or four *per cent.* and at Rome it is from 15 to 25 *per cent.* but at Venice the agio is fixed at 20 *per cent.*

AGIOSYMANDRUM, a wooden inſtrument uſed by the Greek and other churches under the dominion of the Turks, to call together aſſemblies of the people. The *agioſymandrum* was introduced in the place of bells, which the Turks prohibited their Chriſtian ſubjects the uſe of, leſt they ſhould make them ſubſervient to ſedition.

AGIS, king of Lacedæmon, was deſcended from Ageſilaus II. in a right line. He projected the reformation of his kingdom, by the reſtoring of the laws of Lycurgus; but he fell under the weight of an enterpriſe that could not but be diſagreeable to all thoſe who had great poſſeſſions, and had been long accuſtomed to the ſweets of a voluptuous life. Agis being in the flower of his age, and having a very refined deſire of glory, practiſed the ancient diſcipline firſt in his own perſon; his clothes and his table were according to the manners of former times; which is ſo much the more to be admired, becauſe Ageſiſtrata his mother and Archidamia his grandmother had brought him up voluptuouſly. When he ſounded his peoples minds, he found the younger ſort oppoſed his project leſs than thoſe who had enjoyed a relaxation of diſcipline ſeveral years. The greateſt difficulty was expected to ariſe from the women. They had at that time more credit than ever; for their power is never greater than when luxury is in faſhion. Ageſilaus's mother did not at all reliſh the propoſed reformation. She muſt have loſt her riches, which gave her a ſhare in a thouſand ſorts of intrigues; ſo ſhe oppoſed the deſign at once, and treated it as a chimera. But her brother Ageſilaus, whom Agis had engaged in his intereſts, knew how to manage her in ſuch a manner that ſhe promiſed to ſecond the enterpriſe. She endeavoured to gain the women: but inſtead of ſuffering themſelves to be perſuaded, they applied to Leonidas the other king of Lacedæmon, and humbly beſought him to fruſtrate the deſigns of his colleague. Leonidas durſt not oppoſe it openly, for fear of irritating the people; to whom the reformation was agreeable, becauſe they found their account in it. He contented himſelf with countermining it by intrigues, and ſowing ſuſpicions as if Agis had aſpired to tyranny, by pulling down the rich and raiſing the poor. Agis did not fail to propoſe his new laws to the ſenate, relating to the diſcharge of debts, and a new diviſion of the lands. Leonidas, being ſupported by the rich, oppoſed this project ſo ſtrongly, that there was one voice more againſt it than for it. He paid dear for his ſucceſs in this affair. Lyſander, one of the Ephori, who had been the grand promoter of the reformation, called him to account; alleged the celeſtial ſigns; and put to death Cleombrotus, a prince of the royal blood and ſon-in-law to Leonidas, to make ſure of the kingdom. Leonidas being frightened at this, took refuge in a temple; whither his daughter, the wife of Cleombrotus, followed him. He was ſummoned; and becauſe he did not appear, he was degraded of his dignity, which was conferred on Cleombrotus. He obtained leave to retire to Tegæa. The new Ephori had Lyſander and Mandroclidas tried for innovation: theſe perſuaded the two kings to unite and turn out theſe Ephori. The thing was brought about; but not without a great uproar in the city. Ageſilaus, one of the Ephori that ſucceeded thoſe who were juſt turned out, would have cauſed Leonidas to be killed on the way to Tegæa, if Agis had not ſent him a ſtrong guard. The reformation might then have been eſtabliſhed, if Ageſilaus had not found means to elude the good intentions of the two kings. Whilſt this was tranſacting, the Achaians aſked aſſiſtance; which was given them, and Agis had the command of the troops. He acquired a good deal of reputation in this campaign. At his return, he found his affairs ſo embroiled by the ill conduct of Ageſilaus, that it was impoſſible for him to maintain himſelf. Leonidas was recalled to Lacedæmon: Agis retired into one temple and Cleomenes into another. The wife of the latter behaved herſelf in ſuch a manner that ſhe became the admiration of every body. Leonidas was contented with baniſhing his ſon-in-law; after which he applied himſelf entirely to the ruin of Agis. One of the Ephori, who had no mind to return what Ageſiſtrata had lent him, was the principal inſtrument of the misfortune of this family. Agis never went out of his ſanctuary but to bathe. One day, as he was returning from thence to the temple, he was ſeized by that Ephorus and carried to priſon. Then he was brought to his trial and condemned to death, and delivered to the executioner. His mother and grandmother uſed all the intreaty and importunity imaginable, that, as he was king of Lacedæmon, he might at leaſt be permitted to plead his cauſe before the people. But they were apprehenſive leſt his words would make too great an impreſſion, and therefore they ordered him to be ſtrangled that very hour. The Ephorus who was in debt to Ageſiſtrata permitted that princeſs to go into the priſon; which he granted likewiſe to Agis's grandmother; but he gave orders to ſtrangle them one after another. Ageſiſtrata died in a manner that was extremely to her honour. The wife of Agis, who was a princeſs of great fortune and prudence, and one of the fineſt ladies in Greece, was forced away from her apartment by king Leonidas, and obliged to marry his ſon, who was then very young, and hardly fit for marriage.

AGISTMENT, AGISTAGE, or AGISTATION, in law, the taking in other people's cattle to graze at ſo much *per* week. The term is peculiarly uſed for the taking cattle to feed in the king's foreſts, as well as for the profits ariſing from that practice.—It is alſo uſed, in a metaphorical ſenſe, for any tax, burden, or charge; thus, the tax levied for repairing the banks of Romney-marſh was called *agiſtamentum*.

AGISTOR, or AGISTATOR, an officer belonging to foreſts, who has the care of cattle taken in to be grazed, and levies the moneys due on that account. They are generally called *queſt-takers* or *giſt-takers*, and are created by letters-patent. Each royal foreſt has four agiſtors.

AGISYMBA (anc. geog.), a diſtrict of Libya Interior, according to Agathemerus, ſituated to the ſouth-eaſt of the Æthiopes Anthropophagi: the parallel paſſing through which, at 16° to the ſouth of the equator, was the utmoſt extent of the knowledge of the ancients to the ſouth (Ptolemy).

AGITATION, the act of ſhaking a body, or toſſing it backwards and forwards.

AGITATION, in phyſics, is often uſed for an inteſtine commotion of the parts of a natural body. Fermentation and efferveſcence are attended with a briſk agitation of the particles.

AGITATION is one of the chief cauſes or inſtruments of mixtion: by the agitation of the parts of the blood and chyle, in their continual circulation, ſanguification is in a good meaſure effected. Butter is made out of milk by the ſame means: in which operation, a ſeparation is made of the oleous parts from the ſerous, and a conjunction of the oleous together. Digeſtion itſelf is only ſuppoſed to be an inſenſible kind of agitation.

AGITATION is reputed one of the ſymptons of inſpiration. Petit informs us,* that, in the laſt century, there aroſe in a church in Italy, for the ſpace of a year, a vapour of an extraordinary kind, which put all the people into trembling and agitations, and unleſs they got away betimes, ſet them a dancing, with ſtrange contortions and geſticulations. This ſeems to verify what has been related of the temple of Delphi.

AGITATION is alſo uſed in medicine for a ſpecies of exerciſe popularly called *ſwinging*. Maurice prince of Orange found this method a relief againſt the ſevere pains of the gout and ſtone. Bartholine mentions fits of the toothach, deafneſs, &c. removed by vehement agitations of the body.

AGITATOR, in antiquity, a term ſometimes uſed for a charioteer, eſpecially thoſe who drove in the circus at the curule games.

AGITATORS, in the Engliſh hiſtory, certain officers ſet up by the army in 1647, to take care of its intereſts.—Cromwell joined the agitators, only with a view to ſerve his own ends; which being once accompliſhed, he found means to get them aboliſhed.

AGLAIA, the name of the youngeſt of the three Graces, eſpouſed to Vulcan.

AGLIONBY (John), an Engliſh divine, chaplain in ordinary to king James I. a man of univerſal learning, who had a very conſiderable hand in the tranſlation of the New Teſtament appointed by king James I. in 1604.

AGMEN, in antiquity, properly denotes a Roman army in march: in which ſenſe, it ſtands contradiſtinguiſhed from *acies*, which denoted the army in battle array; though, on ſome occaſions, we find the two words uſed indifferently for each other. The Roman armies, in their marches, were divided into *primum agmen*, anſwering to our vanguard; *medium agmen*, our main-battle; and *poſtremum agmen*, the rear-guard. The order of their march was thus: After the firſt ſignal with the trumpets, &c. the tents were taken down, and the baggage packed up; at the ſecond ſignal, the baggage was to be loaden on the horſes and carriages; and at the third ſignal, they were to begin their march.

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* Petit. de Sybilla, l. i. Nouv. Rep. Lett. tom. viii. p. 1113.

Firſt came the *extraordinarii;* then the auxiliaries of the firſt wing, with their baggage; theſe were followed by the legions. The cavalry marched either on each ſide or behind.

AGNATE, in law, any male relation by the father's ſide.

AGNEL, an ancient French gold coin, firſt ſtruck under the reign of St Louis, worth about twelve ſols ſix deniers. The agnel is alſo called ſometimes *mouton d'or*, and *agnel d'or*. The denomination is ſuppoſed to have ariſen from the figure of a lamb, agnus, or ſheep, ſtruck on one ſide.

AGNO, a river of Naples, which, taking its riſe in the mountainous parts of Terra di Lavoro, waſhes the town of Acerra; and, paſſing between Capua and Averſa, falls into the Mediterranean, about ſeven miles north of Puzzuoli.

AGNOETÆ (from αγνοεω, to be *ignorant* of), in church-hiſtory, a ſect of ancient heretics, who maintained that Chriſt, conſidered as to his human nature, was ignorant of certain things, and particularly of the time of the day of judgment. Eulogius, patriarch of Alexandria, aſcribes this hereſy to certain ſolitaries in the neighbourhood of Jeruſalem, who built their opinion upon the text Mark xiii. 32. "Of that day and "hour knoweth no man, no not the angels who are "in heaven, neither the Son, but the father only."—The ſame paſſage was made uſe of by the Arians; and hence the orthodox divines of thoſe days were induced to give various explications thereof. Some allege, that our Saviour here had no regard to his divine nature, but only ſpoke of his human. Others underſtand it thus, That the knowledge of the day of judgment does not concern our Saviour conſidered in his quality of Meſſiah, but God only: which is the moſt natural ſolution.

AGNOMEN, in Roman antiquity, a kind of fourth or honorary name, given to a perſon on account of ſome extraordinary action, virtue, or other accompliſhment. Thus the agnomen *Africanus* was beſtowed upon Publius Cornelius Scipio, on account of his great atchievements in Africa.—The agnomen was the third in order of the three Roman names: thus, in Marcus Tullius Cicero, Marcus is the prænomen, Tullius the nomen, and Cicero the *agnomen*.

AGNUS, or LAMB, in zoology, the young of the ovis or ſheep. See OVIS.

AGNUS Caſtus, in botany, the trivial name of a ſpecies of the vitex. See VITEX. The Greeks call it αγνος, *chaſte;* to which has ſince been added the reduplicative *caſtus, q. d.* chaſte chaſte. It was famous among the ancients as a ſpecific for the preſervation of chaſtity. The Athenian ladies, who made profeſſion of chaſtity, lay upon leaves of *agnus caſtus* during the feaſts of Ceres.—Being reputed a cooler, and particularly of the genital parts, it was anciently uſed in phyſic to allay theſe inordinate motions ariſing from ſeminal turgeſcences: but it is out of the preſent practice.

AGNUS Dei, in the church of Rome, a cake of wax ſtamped with the figure of a lamb ſupporting the banner of the croſs. Theſe being conſecrated by the pope with great ſolemnity, and diſtributed among the people, are ſuppoſed to have great virtues; as, to preſerve thoſe who carry them worthily, and with faith, from all manner of accidents; to expel evil ſpirits, &c. The name literally ſignifies *Lamb of God;* this being ſuppoſed an image or repreſentation of the Lamb of God who took away the ſins of the world. They cover it up with a piece of ſtuff cut in form of a heart, and carry it very devoutly in their proceſſions.—The Romiſh prieſts and religious derive conſiderable pecuniary advantage from ſelling theſe *Agnus Dei's* to ſome, and preſenting them to others. The pope provides a regular ſupply, by conſecrating once in ſeven years; they are diſtributed by the maſter of the wardrobe, and received by the cardinals and other prelates, with great reverence, in their caps and mitres.—This ceremony they pretend to derive from an ancient cuſtom of the church, wherein part of the paſchal taper conſecrated on Holy Thurſday was diſtributed among the people, to perfume their houſes, fields, &c. in order to drive away devils, and to preſerve them from ſtorms and tempeſts. The *Agnus Dei* is forbidden to be brought into England under pain of incurring a *premunire;* 13 Eliz. chap. 2.

AGNUS Dei is alſo a popular name for that part of the maſs wherein the prieſt, ſtriking his breaſt three times, rehearſes, with a loud voice, a prayer beginning with the words *Agnus Dei.*—The *Agnus Dei* is ſaid to have been firſt brought into the miſſal by pope Sergius I.

AGNUS Scythicus. See *Scythian* LAMB.

AGOGE, among ancient muſicians, a ſpecies of modulation, wherein the notes proceed by contiguous degrees.

AGON, among the ancients, implied any diſpute or conteſt, whether it had regard to bodily exerciſes or the accompliſhments of the mind; and therefore poets, muſicians, painters, &c. had their agons, as well as the athletæ. Games of this kind were celebrated at moſt of the heathen feſtivals, with great ſolemnity, either annually, or at certain periods of years. Among the latter were celebrated at Athens, the *agon gymnicus*, the *agon nemeus* inſtituted by the Argives in the 53d Olympiad, and the *agon Olympius* inſtituted by Hercules 430 years before the firſt Olympiad.—The Romans alſo, in imitation of the Greeks, inſtituted conteſts of this kind. The emperor Aurelian eſtabliſhed one under the name of *agon ſolis*, the conteſt of the ſun; Diocleſian another, which he called *agon capitolinus*, which was celebrated every fourth year, after the manner of the Olympic games. Hence the years, inſtead of *luſtra*, are ſometimes numbered by *agones*.

AGON alſo ſignified one of the miniſters employed in the Heathen ſacrifices, and whoſe buſineſs it was to ſtrike the victim. The name is ſuppoſed to have been derived from hence, that ſtanding ready to give the ſtroke he aſked, *Agon'?* or *Agone?* Shall I ſtrike?

AGONALES, an epithet given to the SALII.

AGONALIA, in Roman antiquity, feſtivals celebrated in honour of Janus, or the god Agonius, whom the Romans invoked before undertaking any affair of importance.

AGONALIS CIRCUS, now *La Piazza Navona*, a long, large, beautiful ſtreet in the heart of Rome, adorned with fountains, and the obeliſk of Caracalla, ſtill retaining the form of that circus. The reaſon of the name *Agonalis* is either unknown or doubtful. Ovid ſeems to derive it from the *agones*, or ſolemn games, there celebrated; ſuppoſed to have been the *Ludi Apollinaries*, or *Actiaci*, inſtituted by Auguſtus: whence the circus was called *Apollinaris;* alſo *Alexandrinus*, from the emperor Alexander Severus, who either encloſed or repaired the circus.

AGONISMA, in antiquity, denotes the prize given to the victor in any combat or diſpute.

AGONISTARCHA, from αγον "combat," and αρχος "chief," in antiquity, ſeems to have been much the ſame with *agonotheta;* though ſome ſuggeſt a difference, making it the office of the former to preſide at and direct the private exerciſes of the athletæ, which they went through by way of practice, before they made their appearance on the public theatres or amphitheatres.

AGONISTICI, in church hiſtory, a name given by Donatus to ſuch of his diſciples as he ſent to fairs, markets, and other public places, to propagate his doctrine; for which reaſon they were alſo called *Circuitores*, *Circelliones*, *Catropitæ*, *Coropitæ*, and at Rome, *Montenſes*. They were called *Agoniſtici*, from the Greek αγον, "combat," in regard they were ſent as it were to fight and ſubdue the people to their opinions.

AGONIUM, in Roman antiquity, was uſed for the day on which the *rex ſacrorum* ſacrificed a victim, as well as for the place where the games were celebrated, otherwiſe called *agon*.

AGONOTHETA, or Agonothetes, in Grecian antiquity, was the preſident or ſuperintendant of the ſacred games; who not only defrayed the expence attending them, but inſpected the manners and diſcipline of the athletæ, and adjudged the prizes to the victors.

AGONY, any extreme pain. It is alſo uſed for the pangs of death. Much of the terror of death conſiſts in the pangs and convulſions wherewith the agony ſeems attended; tho' we have reaſon to believe that the pain in ſuch caſes is ordinarily not extremely acute; a courſe of pain and ſickneſs having uſually ſtupified and indiſpoſed the nerves for any quick ſenſations. However, various means have been thought of for mitigating the agony of death. Lord Bacon conſiders this as part of the province of a phyſician; and that not only when ſuch a mitigation may tend to a recovery, but alſo when, there being no farther hopes of a recovery, it can only tend to make the paſſage out of life more calm and eaſy. Complacency in death, which Auguſtus ſo much deſired, is certainly no ſmall part of happineſs. Accordingly the author laſt cited ranks *euthanaſia*, or the art of dying eaſily, among the deſiderata of ſcience; and does not even ſeem to diſapprove of the courſe Epicurus took for that end,

——*Hinc ſtygias ebrius hauſit aquas.*

Opium has been applied for this purpoſe, with the applauſe of ſome, but the condemnation of more.

AGONYCLITÆ, or Agonyclites, in church-hiſtory, a ſect of Chriſtians, in the 7th century, who prayed always ſtanding, as thinking it unlawful to kneel.

AGORÆUS, in heathen antiquity, an appellation given to ſuch deities as had ſtatues in the market-place; particularly Mercury, whoſe ſtatue was to be ſeen in almoſt every public place.

AGORANOMUS, in Grecian antiquity, a magiſtrate of Athens, who had the regulation of weights and meaſures, the prices of proviſions, &c.—The *agoranomi*, at Athens, were ten in number, five belonging to the city, and as many to the Piræus; though others make them fifteen in all, of whom they aſſign ten to the city. To theſe a certain toll or tribute was paid, by all who brought any thing to ſell in the market.

AGOUTI, or Aguti. See Mus.

AGRA, the capital town of a province of the ſame name, in Indoſtan, and in the dominions of the Great-Mogul. It is looked upon as the largeſt city in theſe parts, and is in the form of a half-moon. A man on horſeback can hardly ride round it in a day. It is ſurrounded with a wall of red ſtone, and with a ditch 100 feet wide. The palace is prodigiouſly large, and the ſeraglio commonly contains above 1000 women. There are upwards of 800 baths in this town; but that which travellers moſt admire, is the mauſoleum of one of the Mogul's wives, which was 20 years in building. The indigo of Agra is the moſt valuable of all that comes from the Eaſt Indies. This town is ſeated on the river Jemma, about 50 miles above its confluence with the Tehemel, and is 300 miles N. E. of Surat. E. Long. 79. 12. N. Lat. 26. 29.

AGRARIAN laws, among the Romans, thoſe relating to the diviſion and diſtribution of lands; of which there were a great number; but that called the *Agrarian Law*, by way of eminence, was publiſhed by Spurius Caſſius, about the year of Rome 268, for dividing the conquered lands equally among all the citizens, and limiting the number of acres which each citizen might enjoy.—The Roman lands were of ſeveral kinds; ſome conquered from the enemies, and not yet brought to the public account; others brought indeed to the public, but clandeſtinely uſurped by private great men; laſtly, others purchaſed with the public money, in order to be divided. Agrarian laws either for dividing lands taken from the enemy, or the public lands, or thoſe purchaſed with the public money, were eaſily paſſed without diſturbance; but thoſe whereby private rich men were to be deprived of their lands, and the common people put in poſſeſſion of what had been held by the nobility, were never attempted without great diſturbances.

Several have pleaded for the neceſſity of agrarian laws in England: but no author has entered ſo deeply into the ſubject as Mr Harrington in his *Oceana;* which the reader who chooſes may conſult.

AGREDA, a town of Spain, in Old Caſtile, near the frontiers of Arragon, and about three leagues ſouth-weſt of Taracon.

AGRIA, called by the Germans *Eger*, is a ſmall but ſtrong town in Upper Hungary, and is a biſhop's ſee. It is ſituated on a river of the ſame name, and has a citadel called Eriaw. It was beſieged by the Turks in 1552, with 70,000 men: but they loſt 8000 in one day; and were obliged to raiſe the ſiege, though the garriſon conſiſted only of 2000 Hungorians, aſſiſted by the women, who performed wonders on this occaſion. However, it was afterwards taken by Mahomet III. in 1596; but was retaken by the emperor in 1687; ſince which time it has continued under the dominion of the houſe of Auſtria. It is 47 miles north-eaſt of Buda, and 55 ſouth-weſt of Caſſovia. E. Long. 20. 10. N. Lat. 48. 10.

AGRICOLA (Cneus Junius), born at Frejus in Pro-

Agricola.

Provence, was, in Veſpaſian's time, made lieutenant to Vettius Bolanus in Britain; and, upon his return, was ranked by that emperor among the patricians, and made governor of Aquitania. This poſt he held three years; and upon his return he was choſen counſel, and afterward appointed governor of Britain, where he greatly diſtinguiſhed himſelf. He reformed many abuſes occaſioned by the avarice or negligence of former governors, put a ſtop to extortion, and cauſed juſtice to be impartially adminiſtered. Veſpaſian dying about this time, his ſon Titus, knowing the great merit of Agricola, continued him in the government. In the ſpring, he marched toward the north, where he made ſome new conqueſts and ordered forts to be built for the Romans to winter in. He ſpent the following winter in concerting ſchemes to bring the Britons to conform to the Roman cuſtoms. He thought the beſt way of diverting them from riſing and taking arms, was to ſoften their rough manners, by propoſing to them new kinds of pleaſure, and inſpiring them with a deſire of imitating the Roman manners. Soon after this, the country was adorned with magnificent temples, porticos, baths, and many other fine buildings. The Britiſh nobles had at length their ſons educated in learning; and they who before had the utmoſt averſion to the Roman language, now began to ſtudy it with great aſſiduity: they wore likewiſe the Roman habit; and, as Tacitus obſerves, they were brought to conſider thoſe things as marks of politeneſs, which were only ſo many badges of ſlavery. Agricola, in his third campaign, advanced as far as the Tweed; and in his fourth, he ſubdued the nations betwixt the Tweed and the friths of Edinburgh and Dumbritton, into which the rivers Glotta and Bodotria diſcharge themſelves; and here he built fortreſſes to ſhut up the nations yet unconquered. In his fifth he marched beyond the friths; where he made ſome new acquiſitions, and fixed garriſons along the weſtern coaſts, over againſt Ireland. In his ſixth campaign he paſſed the river Bodotria, ordering his fleet, the firſt which the Romans ever had in thoſe parts, to row along the coaſts and take a view of the northern parts. In the following ſpring, the Britains raiſed an army of 30,000 men; and the command was given to Galgacus, who, according to Tacitus, made an excellent ſpeech to his countrymen on this occaſion. Agricola likewiſe addreſſed his men in very ſtrong and eloquent terms. The Romans gained the victory, and 10,000 of the Britains are ſaid to have been killed. This happened in the reign of the emperor Domitian; who, growing jealous of the glory of Agricola, recalled him, under pretence of making him governor of Syria. Agricola died ſoon after; and his death is ſuſpected to have been occaſioned by poiſon given him by that emperor. Tacitus the hiſtorian married his daughter, wrote his life, and laments his death in the moſt pathetic manner.

Agricola.

Agricola (George), a German phyſician, famous for his ſkill in metals. He was born at Glaucha, in Miſnia, the 24th of March 1492. The diſcoveries which he made in the mountains of Bohemia, gave him ſo great a deſire of examining accurately into every thing relating to metals, that though he had engaged in the practice of phyſic at Joachimſtal by advice of his friends, he ſtill proſecuted his ſtudy of foſſils with great aſſiduity; and at length removed to Chemnitz, where he entirely devoted himſelf to this ſtudy. He ſpent in purſuit of it the penſion he had of Maurice duke of Saxony, and part of his own eſtate; ſo that he reaped more reputation than profit from his labours. He wrote ſeveral pieces upon this and other ſubjects; and died at Chemnitz the 21ſt of November 1555, a very firm Papiſt. In his younger years he ſeemed not averſe to the Proteſtant doctrine; and he highly diſapproved of the ſcandalous traffic of indulgences, and ſeveral other things in the church of Rome. The following lines of his were poſted up in the ſtreets of Zwickaw, in the year 1719:

Si nos injecto ſalvebit ciſtula nummo,
Heu nimium infelix tu mihi, pauper, eris!
Si nos, Chriſte, tua ſervatos morte beaſti,
Tam nihil infelix tu mihi, pauper, eris.

If wealth alone ſalvation can procure,
How ſad a ſtate for ever waits the poor!
But if thou, Chriſt, our only ſaviour be,
Thy merits ſtill may bleſs ev'n poverty!

In the latter part of his life, however, he had attacked the Proteſtant religion: which rendered him ſo odious to the Lutherans, that they ſuffered his body to remain unburied for five days together; ſo that it was obliged to be removed from Chemnitz to Zeits, where it was interred in the principal church.

Agricola (John), a Saxon divine born at Iſlebe in 1492. He went as chaplain to count Mansfield, when that nobleman attended the Elector of Saxony to the diet of Spire in 1526, and that of Augſburg in 1530. He was of a reſtleſs ambitious temper, rivalled and wrote againſt Melancthon, and gave count Mansfield occaſion to reproach him ſeverely. He obtained a profeſſorſhip at Wittemberg, where he taught particular doctrines, and became founder of the ſect of Antinomians; which occaſioned warm diſputes between him and Luther, who had before been his very good friend. But though he was never able to recover the favour either of the Elector of Saxony or of Luther, he received ſome conſolation from the fame he acquired at Berlin: where he became preacher at court; and was choſen in 1548, in conjunction with Julius Phlug and Michael Heldingus, to compoſe the famous *Interim*, which made ſo much noiſe in the world. He died at Berlin in 1566.

AGRICULTURE

Definition.

MAY be defined, The art of diſpoſing the earth in ſuch a manner as to produce whatever vegetables we deſire, in large quantity, and in the greateſt perfection of which their natures are capable.—But though, by this definition, agriculture, ſtrictly ſpeaking, includes in it the cultivation of every ſpecies of vegetable whatever, and conſequently comprehends all that is underſtood of gardening and planting, we mean here to con-ſine ourſelves to the cultivation of thoſe ſpecies of grain, graſs, &c. which are generally neceſſary as food for men and beaſts.

HISTORY.

THE antiquity of this art is undoubtedly beyond that of all others; for we are informed by Scripture, that Adam was ſent from the garden of Eden *to till the ground;* and, this being the caſe, he certainly muſt have known how to do ſo.—It would be ridiculous, however, to imagine that he was acquainted with all the methods of ploughing, harrowing, fallowing, &c. which are now made uſe of; and it would be equally ſo to ſuppoſe, that he uſed ſuch clumſy and unartful inſtruments as wooden hooks, horns of oxen, &c. to dig the ground, which were afterwards employed for this purpoſe by certain ſavages: but as we know nothing of the particular circumſtances in which he was ſituated, we can know as little concerning his method of agriculture.

The prodigious length of life which the antediluvians enjoyed, muſt have been very favourable to the advancement of arts and ſciences, eſpecially agriculture, to which it behoved them to apply themſelves in a particular manner, in order to procure their ſubſiſtence. It is probable, therefore, that, even in the antediluvian world, arts and ſciences had made great progreſs, nay, might be farther advanced in ſome reſpects than they are at preſent. Of this, however, we can form no judgment, as there are no hiſtories of thoſe times, and the ſcripture gives us but very ſlight hints concerning theſe matters.

No doubt, by the terrible cataſtrophe of the flood, which overwhelmed the whole world, many ſciences would be entirely loſt, and agriculture would ſuffer; as it was impoſſible that Noah or his children could put in practice, or perhaps know, all the different methods of cultivating the ground that were formerly uſed. The common methods, however, we cannot but ſuppoſe to have been known to him and his children, and by them tranſmitted to their poſterity: ſo that as long as mankind continued in one body without being diſperſed into different nations, the arts, agriculture eſpecially, would neceſſarily advance; and that they did ſo, is evident from the undertaking of the tower of Babel. It is from the diſperſion of mankind conſequent upon the confuſion of tongues, that we muſt date the origin of ſavage nations. In all ſocieties where different arts are cultivated, there are ſome perſons who have a kind of general knowledge of moſt of thoſe practiſed through the whole ſociety, while others are in a manner ignorant of every one of them. If we ſuppoſe a few people of underſtanding to ſeparate from the reſt, and become the founders of a nation, it will probably be a civilized one, and the arts will begin to flouriſh from its very origin; but, if a nation is founded by others whoſe intellects are in a manner callous to every human ſcience (and of this kind there are many in the moſt learned countries), the little knowledge or memory of arts that were among the original founders will be loſt, and ſuch a people will continue in a ſtate of barbariſm for many ages, unleſs the arts be brought to them from other nations.

From this, or ſimilar cauſes, all nations of equal antiquity have not been equally ſavage, nor is there any ſolid reaſons for concluding that all nations were originally unſkilled in agriculture; though as we know not the original inſtruments of huſbandry uſed by mankind when living in one ſociety, we cannot fix the date of the improvements in this art. Different nations have always been in a different ſtate of civilization; and agriculture, as well as other arts, has always been in different degrees of improvement among different nations at the ſame time.

From the earlieſt accounts of the eaſtern nations, we have reaſon to think, that agriculture has at all times been underſtood by them in conſiderable perfection; ſeeing they were always ſupplied not only with the neceſſaries, but the greateſt luxuries of life.

As ſoon as the deſcendants of Abraham were ſettled in Paleſtine, they generally became huſbandmen, from the chiefs of the tribe of Judah to the loweſt branch of the family of Benjamin. High birth or rank did not at that time make any diſtinction, for agriculture was conſidered as the moſt honourable of all employments; witneſs the illuſtrious examples of Gideon, Saul, and David.

The Chaldeans, who inhabited the country where agriculture had its birth, carried that valuable art to a degree of excellence unknown in former times. They cultivated their lands with great aſſiduity, and ſeem to have found out ſome means of reſtoring fertility to an exhauſted ſoil, by having plentiful harveſts in ſucceſſion; on which account they were not obliged, as their predeceſſors had been, to change their ſituations, in order to obtain a ſufficiency for themſelves and their numerous flocks and herds.

The Egyptians, who, from the natural fertility of their country by the overflowing of the Nile, raiſed every year vaſt quantities of corn, were ſo ſenſible of the bleſſings reſulting from agriculture, that they aſcribed the invention of that art to Oſiris. They alſo regarded Iſis, their ſecond deity, as the diſcoverer of the uſe of wheat and barley, which before grew wild in the fields, and were not applied by that people to the purpoſes of food. Their ſuperſtitious gratitude was carried ſo far, as to worſhip thoſe animals which were employed in tillage; and even to the produce of their lands, as leeks, onions, &c.

The divine honours paid to Bacchus in India were derived from the ſame ſource, he being conſidered in that country as the inventor of planting vineyards, and the other arts attendant upon agriculture.

It is alſo related of the ancient Perſians, on the moſt reſpectable authority, that their kings laid aſide their grandeur once every month to eat with huſbandmen. This is a ſtriking inſtance of the high eſtimation in which they held agriculture; for at that time arts were practiſed among that people in great perfection, particularly thoſe of weaving, needle-work, and embroidery. The precepts of the religion taught by their ancient magi, or prieſts, included the practice of agriculture. The *ſaint* among them was obliged to work out his ſalvation by purſuing all the labours of agriculture: And it was a maxim of the Zendaveſta, that he who ſows the ground with care and diligence, acquires a greater degree of religious merit, than he could have gained by the repetition of ten thouſand prayers.

The Phenicians, ſo well known in ſcripture by the name of *Philiſtines*, were alſo remarkable for their attention to and ſkill in agriculture. But finding themſelves too much diſturbed and confined by the incurſions and conqueſts of the Iſraelites, they ſpread themſelves throughout the greateſt part of the Mediterranean iſlands, and carried with them their knowledge in the arts of cultivation.

Mago, a famous general of the Carthaginians, is ſaid to have written no leſs than 28 books on the ſubject; which Columella tells us were tranſlated into Latin by the expreſs order of the Roman ſenate. We are informed by the ancient writers, that Ceres was born in Sicily, where ſhe firſt invented the arts of tillage and of ſowing corn. For this eſſential ſervice, ſhe was, agreeably to the ſuperſtition of thoſe ages, deified, and worſhipped as the goddeſs of plenty. The truth of this is, that in the time of Ceres, the iſland, through her endeavours and the induſtry of the people, became very fruitful in corn; and agriculture was there eſteemed ſo honourable an employment, that even their kings did not diſdain to practiſe it with their own hands.

But time, which at firſt gave birth to arts, often cauſed them to be forgotten when they were removed from the place of their origin. The deſcendants of Noah, who ſettled in Europe, doubtleſs carried their knowledge of agriculture with them into the regions which they ſucceſſively occupied. But thoſe who took poſſeſſion of Greece were ſuch an uncivilized race, that they fed on roots, herbs, and acorns, after the manner of beaſts. Pelaſgus had taught them the culture of the oak, and the uſe of acorns as food; for which ſervice, we are told, divine honours were paid him by the people.

The Athenians, who were the firſt people that acquired any tincture of politeneſs, taught the uſe of corn to the reſt of the Greeks. They alſo inſtructed them how to cultivate the ground, and to prepare it for the reception of the ſeed. This art, we are told, was taught them by Triptolemus. The Greeks ſoon perceived that bread was more wholeſome, and its taſte more delicate, than that of acorns and the wild roots of the fields; accordingly they thanked the gods for ſuch an unexpected and beneficial preſent, and honoured their benefactor.

As the arts of cultivation increaſed, and the bleſſings they afforded became generally experienced, the people ſoon preferred them to whatever the ravages of conqueſt, and the cruel depredations of ſavage life, could procure. And accordingly we find, that the Athenian kings, thinking it more glorious to govern a ſmall ſtate wiſely, than to aggrandize themſelves, and enlarge the extent of their dominions by foreign conqueſts, withdrew their ſubjects from war, and moſtly employed them in cultivating the earth. Thus, by continued application, they brought agriculture to a conſiderable degree of perfection, and ſoon reduced it to an art.

Heſiod was the firſt we knew of among the Greeks who wrote on this intereſting ſubject. According to the cuſtom of the Oriental authors, he wrote in poetry, and embelliſhed his poem with luxuriant deſcription and ſublime imagery. He calls his poem *Weeks and Days*, becauſe agriculture requires exact obſervations on times and ſeaſons.

Xenophon has alſo, in his Oeconomics, remarked, that agriculture is the nurſing mother of the arts. For, ſays he, "where agriculture ſucceeds proſperouſly, there the arts thrive; but where the earth neceſſarily lies uncultivated, there the other arts are deſtroyed."

Other eminent Greek writers upon agriculture were, Democritus of Abdera, Socraticus, Archytas, Tarentinus, Ariſtotle, and Theophraſtus, from whom the art received conſiderable improvements.

The ancient Romans eſteemed agriculture ſo honourable an employment, that the moſt illuſtrious ſenators of the empire, in the intervals of public concerns, applied themſelves to this profeſſion; and ſuch was the ſimplicity of thoſe ages, that they aſſumed no appearance of magnificence and ſplendor, or of majeſty, but when they appeared in public. At their return from the toils of war, the taking of cities, and the ſubduing of hoſtile nations, their greateſt generals were impatient till they were again employed in the arts of cultivation.

Regulus, when in Africa, requeſted of the ſenate to be recalled, leſt his farm might ſuffer, for want of proper cultivation, in his abſence; and the ſenate wrote him for anſwer, that it ſhould be taken care of at the public expence, while he continued to lead their armies.

Cato the cenſor, after having governed extenſive provinces, and ſubdued many warlike nations, did not think it below his dignity to write a Treatiſe on Agriculture. This work (as we are told by Servius) he dedicated to his own ſon, it being the firſt Latin treatiſe written on this important ſubject; and it has been handed down to us in all its purity, in the manner that Cato wrote it.

Varro compoſed a treatiſe on the ſame ſubject, and on a more regular plan. This work is embelliſhed with all the Greek and Latin erudition of that learned author, who died 28 years before the commencement of the Chriſtian æra. Virgil, who lived about the ſame time, has, in his Georgics, adorned this ſubject with the language of the Muſes, and finely illuſtrated the precepts and rules of huſbandry left by Heſiod, Mago, and Varro.

Columella, who flouriſhed in the reign of the emperor Claudius, wrote 12 books on huſbandry, replete with important inſtruction.

From this period to that of the reign of Conſtantine Poganatus, huſbandry continued in a declining ſtate; but that wiſe emperor cauſed a large collection of the moſt uſeful precepts relating to agriculture to be extracted from the beſt writers, and publiſhed them under the title of *Geoponics*. It has been aſſerted, that he made this collection with his own hand; and the truth of the aſſertion is not improbable, as it is well known, that after he had conquered the Saracens and the Arabians, he not only practiſed and encouraged, but ſtudied the arts of peace, fixing his principal attention on agriculture, as their beſt foundation.

After the death of Conſtantine, however, the increaſing attention of the people to commerce, and the ignorance and groſs ſuperſtition of the ages which ſucceeded, ſeems to have rendered agriculture an almoſt neglected ſcience. The irruptions of the northern nations ſoon aboliſhed any improved ſyſtem. Theſe innumerable and enterpriſing barbarians, who over-ran all Europe, were originally ſhepherds or hunters, like the preſent Tartars and the ſavages of America. They contented themſelves with poſſeſſing thoſe vaſt deſarts made by their own ravages, without labour or trouble, cultivating only a very ſmall ſpot near their habitations: and in this trifling huſbandry only the meaneſt ſlaves were employed: ſo that the art itſelf, which formerly was thought worthy of the ſtudy of kings, was now looked upon as mean and ignoble; a prejudice which is ſcarcely effaced at preſent, or at leaſt but very lately.—During this period, therefore, we find no veſtiges of any thing tolerably written on the ſubject. No new attempts were made to revive it, or to improve it, till the year 1478, when Creſcenzio publiſhed an excellent performance on the ſubject at Florence. This rouzed the ſlumbering attention of his countrymen, ſeveral of whom ſoon followed his example. Among theſe, Tatti, Steffano Auguſtino Gallo, Sanſovino, Lauro, and Tarello, deſerve particular notice.

At what time agriculture was introduced into Britain, is uncertain. When Julius Cæſar firſt invaded that iſland, it was not wholly unknown. That conqueror was of opinion, that agriculture was firſt introduced by ſome of thoſe colonies from Gaul which had ſettled in the ſouthern parts of Britain, about 100 years before the Roman invaſion *.

It is not to be expected that we can now be acquainted with many of the practices of theſe ancient huſbandmen. It appears, however, that they were not unacquainted with the uſe of manures, particularly marle. This we have on the authority of Pliny†, who tells us, that it was peculiar to the people of Gaul and of Britain; that its effects continued 80 years; and that no man was ever known to marle his field twice, &c.—It is highly probable, too, that lime was at this time alſo uſed as a manure in Britain, it being certainly made uſe of in Gaul for this purpoſe at the time of Julius Cæſar's invaſion.

The eſtabliſhment of the Romans in Britain produced great improvements in agriculture, inſomuch that prodigious quantities of corn were annually exported from the iſland; but when the Roman power began to decline, this, like all the other arts, declined alſo, and was almoſt totally deſtroyed by the departure of that people. The unhappy Britons were now expoſed to frequent incurſions of the Scots and Picts, who deſtroyed the fruits of their labours, and interrupted them in the exerciſe of their art. After the arrival of the Saxons in the year 449, they were involved in ſuch long wars, and underwent ſo many calamities, that the huſbandmen gradually loſt much of their ſkill, and were at laſt driven from thoſe parts of the country which were moſt proper for cultivation.

After the Britons retired into Wales, though it appears from the laws made relative to this art, that agriculture was thought worthy of the attention of the legiſlature, yet their inſtruments appear to have been very unartful. It was enacted that no man ſhould undertake to guide a plough who could not make one; and that the driver ſhould make the ropes of twiſted willows, with which it was drawn. It was uſual for ſix or eight perſons to form themſelves into a ſociety for fitting out one of theſe ploughs, providing it with oxen and every thing neceſſary for ploughing; and many minute and curious laws were made for the regulation of ſuch ſocieties. If any perſon laid dung on a field with the conſent of the proprietor, he was by law allowed the uſe of that land for one year. If the dung was carried out in a cart in great abundance, he was to have the uſe of the land for three years. Whoever cut down a wood, and converted the ground into arable, with the conſent of the owner, was to have the uſe of it for five years. If any one folded his cattle, for one year, upon a piece of ground belonging to another, with the owner's conſent, he was allowed the uſe of that field for four years.

Thus, though the Britons had in a great meaſure loſt the knowledge of agriculture, they appear to have been very aſſiduous in giving encouragement to ſuch as would attempt a revival of it; but, among the Anglo-Saxons, things were not at preſent in ſo good a ſtate. Theſe reſtleſs and haughty warriors, having contracted a diſtaſte and contempt for agriculture, were at pains to enact laws to prevent its being followed by any other than women and ſlaves. When they firſt arrived in Britain, they had no occaſion for this art, being ſupplied by the natives with all the neceſſaries of life. After the commencement of hoſtilities, the Saxons ſubſiſted chiefly by plunder: but having driven out or extirpated moſt of the ancient Britons, and divided their lands among themſelves, they found themſelves in danger of ſtarving, there being now no enemy to plunder; and therefore they were obliged to apply to agriculture.

The Saxon princes and great men, who, in the diviſion of the lands, had received the greateſt ſhares, are ſaid to have ſubdivided their eſtates into two parts, which were called the *in-lands* and the *out-lands*. The inlands were thoſe which lay moſt contiguous to the manſion-houſe of their owner, which he kept in his own poſſeſſion, and cultivated by his ſlaves, under the direction of a bailiff, for the purpoſe of raiſing proviſions for the family. The out-lands were thoſe at a greater diſtance from the houſe, and were let to the *ceorls*, or farmers of thoſe times, at very moderate rents. By the laws of Ina king of the weſt Saxons, who reigned in the end of the ſeventh and beginning of the eighth century, a farm conſiſting of ten hides, or plough-lands, was to pay the following rent: "Ten caſks of honey; three hundred loaves of bread; twelve caſks of ſtrong ale; thirty caſks of ſmall ale; two oxen; ten wedders; ten geeſe; twenty hens; ten cheeſes; one caſk of butter; five ſalmon; twenty pounds of forage; and one hundred eels." From this low rent, the imperfection of agriculture at that time is eaſily diſcoverable; but it is ſtill more ſo from the low prices at which land was then ſold. In the ancient hiſtory of the church of Ely, publiſhed by Dr Gale, there are accounts of many purchaſes of lands by Ædelwold the founder of that church, and by other benefactors, in the reign of Edgar the Peaceable, in the tenth century. By a compariſon of theſe accounts it appears, that the ordinary price of an acre of the beſt land in that part of England, in thoſe times, was no more than 16 Saxon pennies, or about four ſhillings ſterling: a very trifling price, even in compariſon with that of other commodities at the ſame time: for, by comparing other accounts, it appears, that four ſheep were then equal in value to an acre of the beſt land, and one horſe of the ſame value with three acres. The frequent and deplorable famines which afflicted England about this time, are further inſtances of the wretched ſtate of agriculture. In 1043, a quarter of wheat ſold

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* Cæſar de Bell Gall. lib. 5. c. 12.

† Plin. Nat. Hiſt. lib. 17 cap. 6.

for 60 Saxon pennies (15 ſhillings ſterling), and at that time equal in value to ſeven or eight pounds ſterling at preſent.

The invaſion of the Normans, in 1066, contributed very much to the improvement of agriculture; for, by that event, many thouſands of huſbandmen from Flanders, France, and Normandy, ſettled in Britain, obtained eſtates or farms, and cultivated them after the manner of their country. The implements of huſbandry, uſed at this time, were of the ſame kind with thoſe employed at preſent; but ſome of them were leſs perfect in their conſtruction. The plough, for example, had but one ſtilt or handle, which the ploughman guided with one hand, having in his other hand an inſtrument which ſerved both for cleaning and mending the plough, as well as for breaking the clods. The Norman plough had two wheels; and in the light ſoil of Normandy was commonly drawn by one or two oxen; but, in England, a greater number was often neceſſary. In Wales, the perſon who conducted the oxen in the plough walked backwards. Their carts, harrows, ſcythes, ſickles, and flails, from the figures of them ſtill remaining, appear to have been nearly of the ſame conſtruction with thoſe that are now uſed. In Wales, they did not uſe a ſickle for reaping their corn, but an inſtrument like the blade of a knife, with a wooden handle at each end.—Their chief manure, next to dung, ſeems ſtill to have been marle. Summer fallowing of lands deſigned for wheat, and ploughing them ſeveral times, appear to have been frequent practices of the Engliſh farmers in this period.

We are, after all, very much in the dark with reſpect to the ſtate and progreſs of agriculture in Great Britain previous to the fourteenth century. That it was pretty generally practiſed, eſpecially in the eaſtern, ſouth, and midland parts of England, is certain; but of the mode, and the ſucceſs, we are left almoſt totally ignorant. In the latter end of the fifteenth century, however, it ſeems to have been cultivated as a ſcience, and received very great improvement.

At this time, Fitzherbert, Judge of the Common-Pleas, in England, ſhone forth with diſtinguiſhed eminence in the practical parts of huſbandry. He appears to have been the firſt Engliſhman who ſtudied the nature of ſoils, and the laws of vegetation, with philoſophical attention. On theſe he formed a theory confirmed by experiments, and rendered the ſtudy pleaſing as well as profitable, by realizing the principles of the ancients, to the honour and advantage of his country. Accordingly, he publiſhed two treatiſes on this ſubject; the firſt, intitled *The Book of Huſbandry*, appeared 1534; and the ſecond, called *The Book of Surveying and Improvements*, in 1539. Theſe books being written at a time when philoſophy and ſcience were but juſt emerging from that gloom in which they had long been buried, were doubtleſs replete with many errors, but they contained the rudiments of true knowledge, and revived the ſtudy and love of an art, the advantages of which were obvious to men of the leaſt reflection. We therefore find that Fitzherbert's books on Agriculture ſoon raiſed a ſpirit of emulation in his countrymen, and many treatiſes of the ſame kind ſucceſſively appeared, which time has however deprived us of, or at leaſt they are become ſo very ſcarce as only to be found in the libraries of the curious.

About the year 1600, France made ſome conſiderable efforts to revive the arts of huſbandry, as appears from ſeveral large works, particularly *Les Moyens de devenir Riche*; and the *Coſmopolite*, by Bernard de Paliſſy, a poor potter, who ſeems to have been placed by fortune in a ſtation for which nature never intended him; *Le Theatre d'Agriculture*, by Deſerres; and *L'Agriculture et Maiſon Ruſtique*, by Meſſrs Etienne, Liebault, &c.

Nearly in the ſame period, the practice of huſbandry became more prevalent among this people and the Flemings than the publiſhing of books on the ſubject. Their intention ſeemed to be that of carrying on a private lucrative employment, without inſtructing their neighbours. Whoever therefore became deſirous of copying their method of agriculture, was obliged to viſit that country, and make his own remarks on their practice.

The principal idea they had of huſbandry was, by keeping the lands clean and in fine tilth, to make a farm reſemble a garden as nearly as poſſible.

Such an excellent principle, at firſt ſetting out, led them of courſe to undertake the culture of ſmall farms only, which they kept free from weeds, continually turning the ground, and manuring it plentifully and judiciouſly. When they had by this method brought the ſoil to a proper degree of cleanlineſs, health, and ſweetneſs, they chiefly cultivated the more delicate graſſes, as the ſureſt means of obtaining a certain profit upon a ſmall eſtate, without the expence of keeping many draught horſes and ſervants. A few years experience was ſufficient to convince them, that ten acres of the beſt vegetables for feeding cattle, properly cultivated, would maintain a larger ſtock of grazing animals than forty acres of common farm graſs on land badly cultivated. They alſo found that the beſt vegetables for this purpoſe were lucerne, ſaintfoin, trefoil of all kinds, field turnips, &c.

The grand political ſecret of their huſbandry, therefore, conſiſted in letting farms on improvement. They are ſaid alſo to have diſcovered nine ſorts of manure; but what they all were, we are not particularly informed. We find, however, that marle was one of them; the uſe and virtues of which appear alſo to have been well known in England two hundred years ago, although it was afterwards much neglected. They were the firſt people among the moderns who ploughed in green crops for the ſake of fertilizing the ſoil; and who confined their ſheep at night in large ſheds built on purpoſe, the floors of which were covered with ſand or virgin earth, &c. which the ſhepherd carted away each morning to the compoſt dunghill.

In England, during the civil wars, though the operations and improvements in huſbandry ſuffered ſome temporary checks, there flouriſhed ſeveral excellent writers on the ſubject, and the art itſelf received conſiderable encouragement. Sir Hugh Platt was one of the moſt ingenious huſbandmen of the age in which he lived; yet ſo great was his modeſty, that all his works except his Paradiſe of Flora, ſeem to be poſthumous. He held a correſpondence with moſt of the lovers and patrons of agriculture and gardening in England; and ſuch was the juſtice and modeſty of his temper, that he always named the author of every diſcovery communicated to him. Perhaps no man in any age diſcovered, or at leaſt brought into uſe, ſo many new kinds of manure. This will be evident to thoſe who read his account of the compoſt and covered dung-hills, and his judicious obſervations on the fertilizing qualities lodged in ſalt, ſtreet-dirt, and the ſullage of ſtreets in great cities, clay, fuller's earth, mooriſh earths, dung-hills made in layers, fern, hair, calcination of all vegetables, malt-duſt, willow-tree earth, ſoaper's aſhes, urine, marle, and broken pilchards.

Gabriel Plattes may be ſaid to have been an original genius in huſbandry. He began his obſervations at an earlier period, in the reign of Queen Elizabeth, and continued them down to the Commonwealth. But notwithſtanding the great merit of this writer, and the eſſential ſervice he had rendered his country by his writings, the public ungratefully ſuffered him to ſtarve and periſh in the ſtreets of London; nor had he a ſhirt on his back when he died.

Samuel Hartlib, a celebrated writer on agriculture in the laſt century, was highly eſteemed and beloved by Milton, and other great men of his time. In the preface to his work intitled *His Legacy*, he laments that no public director of huſbandry was eſtabliſhed in England by authority; and that they had not adopted the Flemiſh method of letting farms upon improvement. This remark of Hartlib's procured him a penſion of L.100 a-year from Cromwell; and the writer afterwards, the better to fulfil the intention of his benefactor, procured Dr Beatti's excellent annotation of the Legacy, with other valuable papers from his numerous correſpondents.

The time in which Hartlib flouriſhed ſeems to have been an æra when the Engliſh huſbandry roſe to great perfection, compared to that of former ages; for the preceding wars had impoveriſhed the country gentlemen, and of courſe made them induſtrious. They found the cultivation of their own lands to be the moſt profitable ſtation they could fill. But this wiſe turn was not of long continuance. At the Reſtoration, they generally became infected with that intoxication and love of pleaſure which ſucceeded. All their induſtry and knowledge were exchanged for neglect and diſſipation; and huſbandry deſcended almoſt entirely into the hands of common farmers.

Evelyn was the firſt writer who inſpired his countrymen with a deſire of reviving the ſtudy of agriculture; and he was followed by the famous Jethro Tull. The former, by his admirable treatiſes on earth and on planting, and the latter, by ſhowing the ſuperior advantages of the drill-huſbandry, excited numbers to bring their theory to the teſt of fair experiment.

Many valuable and capital improvements have, ſince that period, been made in Engliſh huſbandry; and theſe great men have been ſucceeded by a variety of writers, many of whom have done eſſential ſervice, by enlightening the minds of their countrymen, and exciting them to emulation.

About the middle of the laſt century, Ireland began to make a conſiderable figure in the art of huſbandry. It muſt indeed be confeſſed, that the Iriſh had very ſtrong prejudices in favour of a wretched method of agriculture, till Blyth opened their eyes by his excellent writings. Since that time, a ſpirit of improvement has more or leſs been promoted, and in many inſtances carried on with great zeal, by the nobility, clergy, and gentry of that kingdom. In proof of this, it will be ſufficient to obſerve, that the Tranſactions of the Dublin Society for encouraging Huſbandry are now cited by all foreigners in their memoirs relating to that ſubject. And the obſervations of that diſcerning and judicious writer, Arthur Young, Eſq; in his late Tour through that kingdom, ſhow, that in many reſpects improvements there have of late years made a progreſs nearly as rapid as in England.

After the peace of Aix-la-Chapelle, moſt of the nations of Europe, by a ſort of tacit conſent, applied themſelves to the ſtudy of agriculture, and continued to do ſo, more or leſs, amidſt the univerſal confuſion that ſucceeded.

The French found, by repeated experience, that they could never maintain a long war, or procure a tolerable peace, unleſs they could raiſe corn enough to ſupport themſelves in ſuch a manner as not to be obliged to harſh terms on the one hand, or to periſh by famine on the other. This occaſioned the king to give public encouragement to agriculture, and even to be preſent at the making of ſeveral experiments. The great, and the rich of various ranks and ſtations, followed his example; and even the ladies were candidates for a ſhare of fame in this public-ſpirited and commendable undertaking.

During the hurry and diſtreſſes of France in the war of 1756, conſiderable attention was paid to agriculture. Prize-queſtions were annually propoſed in their rural academies, particularly thoſe of Lyons and Bourdeaux; and many judicious obſervations were made by the Society for improving agriculture in Brittany.

Since the concluſion of that war in 1763, matters have been carried on there with great vigour. The univerſity of Amiens made various propoſals for the advancement of huſbandry; and the Marquis de Tourbilly (a writer who proceeded chiefly on experience) had the principal direction of a Georgical ſociety eſtabliſhed at Tours.

The ſociety at Rouen alſo deſerves notice; nor have the king and his miniſters thought it unworthy their attention. There are at preſent about fifteen ſocieties exiſting in France, eſtabliſhed by royal approbation, for the promoting of agriculture; and theſe have twenty co-operating ſocieties belonging to them.

About this time vigorous exertions began to be made in Ruſſia to introduce the moſt approved ſyſtem of huſbandry which had taken place in other parts of Europe. The preſent Empreſs has ſent ſeveral gentlemen into Britain and other countries to ſtudy agriculture, and is giving it all poſſible encouragement in her own dominions.

The art of agriculture has alſo been for near thirty years publicly taught in the Swediſh, Daniſh, and German univerſities, where the profeſſors may render effectual ſervice to their reſpective countries, if they underſtand the practical as well as the ſpeculative part, and can converſe with as much advantage with the farmer as with Virgil and Columella.

Even Italy has not been totally inactive. The Neapolitans of this age have condeſcended to recur to the firſt rudiments of revived huſbandry, and begun to ſtudy anew the Agricultural Syſtem of Creſcenzio, firſt publiſhed in 1478. The people of Bergamo have purſued

ſued the ſame plan, and given a new edition of the Ricordo d'Agricultura de Tarello, firſt publiſhed in 1577. The dutchy of Tuſcany have imbibed the ſame ſpirit for improvement. A private gentleman, above 40 years ſince, left his whole fortune to endow an academy of agriculture. The firſt eccleſiaſtic in the dutchy is preſident of this ſociety, and many of the chief nobility are members.

His Sardinian Majeſty has alſo ſent perſons to learn the different modes of practice in foreign countries; and made ſome ſpirited attempts to eſtabliſh a better method of agriculture among his ſubjects.

In Poland, alſo, M. De Bieluſki, grand marſhal of the crown, has made many ſucceſsful attempts to introduce the new huſbandry among his countrymen; and procured the beſt inſtruments for that purpoſe from France, England, and other parts of Europe.

The Hollanders are the only people now in Europe who ſeem to look upon agriculture with indifference. Except the ſingle collateral inſtance of draining their fens and moraſſes, they have ſcarcely paid any attention to it; and even this ſeems to have proceeded more from the motive of ſelf-preſervation than any love of, or diſpoſition to, huſbandry.

In the year 1756, a few ingenious and public-ſpirited men at Berne in Switzerland eſtabliſhed a ſociety for the advancement of agriculture and rural œconomics. In that ſociety were many men of great weight in the republic, and moſt of them perſons of a true caſt for making improvements in huſbandry, being enabled to join the practice with the theory.

Nor muſt we here omit to mention, that the juſtly celebrated Linnæus and his diſciples have performed great things in the north of Europe, particularly in diſcovering new kinds of profitable and well-taſted food for cattle. About the ſame time, Sweden beſtowed ſucceſsful labours on a ſoil which had before been looked upon as cold, barren, and incapable of melioration. Of this the Stockholm Memoirs will be a laſting monument.

Denmark, and many of the courts in Germany, followed the ſame example. Woollen manufactures were encouraged, and his Daniſh Majeſty ſent three perſons into Arabia Felix to make remarks, and bring over ſuch plants and trees as would be uſeful in huſbandry, building, and rural affairs.

The dutchy of Wirtemburgh, alſo, a country by no means unfertile, but even friendly to corn and paſturage, has contributed its aſſiſtance towards the improvement of agriculture, having more than 30 years ſince publiſhed 14 œconomical relations at Stutgard.

Neither muſt we forget the very aſſiduous attention of the learned in Leipſic and Hanover to this important object. During the rage and devaſtation of a long war, they cultivated the arts of peace; witneſs the *Journal d'Agriculture* printed at Leipſic, and the *Recueils d'Hanover* printed in that city.

Even Spain, conſtitutionally and habitually inactive on ſuch occaſions, in ſpite of all their natural indolence, and the prejudices of bigotry, invited Linnæus, with the offer of a large penſion, to ſuperintend a college founded for the purpoſe of making new enquiries into the hiſtory of Nature and the art of agriculture.

Among the Japaneſe, agriculture is in great repute; and among the Chineſe it is diſtinguiſhed and encouraged by the court beyond all other ſciences. The Emperor of China yearly, at the beginning of ſpring, goes to plough in perſon, attended by all the princes and grandees of the empire. The ceremony is performed with great ſolemnity; and is accompanied with a ſacrifice, which the emperor, as high-prieſt, offers to Chang-Ti, to enſure a plentiful crop in favour of his people.

But, without any improper partiality, we are fully juſtified in aſſerting, that Britain alone exceeds all modern nations in huſbandry; and from the ſpirit which for the laſt twenty years has animated many of her nobility and gentry, to become the liberal patrons of improvement, there is reaſon to believe that this moſt uſeful of arts will, in a few years, be carried to a greater pitch of perfection than it has ever yet attained in any age or country.—The Royal Society, the Bath Society, and the Society of Arts, &c. in particular, have been ſignally uſeful in this reſpect; and other aſſociations, which are now eſtabliſhed in many parts of this kingdom, co-operate with them in forwarding their laudable deſign.

It is not, however, to the exertions of public ſocieties, excellent and honourable as they are, that all the modern improvements in agriculture owe their origin. To the natural genius of the people have been added the theory and practice of all nations in ancient and modern times. This accumulated maſs of knowledge has been arranged, divided, and ſubdivided; and after paſſing the teſt of practical experiments, the eſſential and moſt valuable parts of it have been preſerved, improved, and amply diffuſed in the works of Lord Kames, Mr Young, Stillingfleet, Dr Hunter, Anderſon, Dickſon, Ellis, Randal, Liſle, Marſhal, Mortimer, Duhamel, Bradley, Kent, Mills, and a few other writers upon this grand art of rendering mankind happy, wealthy, and powerful.

PART I. THEORY OF AGRICULTURE.

IN an art ſo extenſively uſeful to mankind, and which has been ſo univerſally practiſed ſince the creation of the world, it is natural to expect the moſt exact and perfect theory. But in this we are totally diſappointed.

1 Ignorance of the food of vegetables, the reaſon of imperfection in the theory of agriculture.

One reaſon of this want of a diſtinct theory of agriculture is, the ignorance of what is properly the food of vegetables; for as the art of agriculture conſiſts principally in ſupplying them with a proper quantity of food, in the moſt favourable circumſtances, it is evident, we might proceed upon a much ſurer foundation if we could aſcertain what their proper nouriſhment is, than we can do without this knowledge. —The reaſon of the great differences regarding the practice, probably, is the difficulty of making experiments in agriculture. It is not in this art as in Mechanics, Chemiſtry, &c. where an experiment can be made in an hour, or a day or two at fartheſt: an experiment in agriculture cannot be properly made in leſs than ſeveral years. Some favourable unobſerved circumſtances, quite foreign to the experiment itſelf, may concur to produce plentiful crops for a year or two:

and thus the farmer may be induced to publiſh his fancied improvements; which failing in the hands of others, or perhaps even in his own on a repetition of the experiment, the new improvements are totally neglected, and things continue in their old way. Were he, however capable of ſeeing and handling the food of vegetables, as well as he can do that of a horſe or an ox, and procuring it in any imaginable quantity, it is plain, that he would be able to cauſe vegetables grow in their utmoſt luxuriancy, or, if we may be allowed the expreſſion, *fatten* them, with as great certainty as he can fatten a horſe or an ox, when he hath plenty of proper food to give them.—To aſcertain what this food is, therefore, muſt be a ſtep towards the perfection of agriculture; and to this we ſhall contribute our endeavour.

SECT I. *Of the proper Food of Plants.*

2 Various ſuppoſitions concerning the food of plants.

We ſhall not here ſpend time in refuting the theories of thoſe who imagined the vegetable food to conſiſt of oily and ſaline ſubſtances. A more probable ſuppoſition has been, That Water and Air are the proper vegetable food, to which alone they owe their increaſe in bulk and weight.—That plants cannot be ſupported without both theſe, is very certain: but we know, that air is a compound fluid; and water is never without ſome impurities, ſo may alſo be conſidered as a compound.—Is it then the aqueous, the earthy, the acid, or the phlogiſtic part of the air, which nouriſhes plants? In like manner, is it the pure elementary part of water which nouriſhes them? or does it contribute to their growth only by the heterogeneous ſubſtances which it contains?

3 Vegetables thrive in putrid air.

From Dr Prieſtley's experiments on different kinds of air, it appears that the pureſt kind of that fluid is not the fitteſt for the purpoſes of vegetation. On the contrary, vegetables flouriſhed in a ſurpriſing degree when confined in a ſmall quantity of air made perfectly noxious by the putrid effluvia of animal bodies.—Hence it appears probable, that ſuch effluvia, or, in other words, the eſſence of corrupted matter, conſtitute at leaſt one ſpecies of vegetable food; and when vegetables are put into ſuch circumſtances that the ſteams of putrefying bodies can have acceſs to them, we are ſure they will thrive the better.

4 Water capable of imbibing putrid effluvia.

The Doctor alſo found, that by agitating putrid air in water, part of which was expoſed to the atmoſphere, the water acquired a very putrid noxious ſmell; which ſhows, that water, as well as air, is capable of abſorbing thoſe effluvia which are found proper food for vegetables. We cannot help concluding, therefore, that in the continual aſcent of water in vapour, and its deſcent again in rain, which is a much more effectual *agitation* than could be made by Dr Prieſtley, the water muſt be very intimately combined with the *phlogiſtic* or putrid effluvia which are contained in the air. To this union we are led ſtrongly to ſuſpect that rain-water owes its fertilizing qualities; for the pureſt ſpring waters, though moſt wholeſome for animals, are not found to be fitteſt
5 Putrid effluvia the proper food of plants.
for promoting the growth of vegetables.—As, therefore, vegetables evidently receive nouriſhment both by their leaves and roots, and increaſe remarkably in bulk by abſorbing the putrid effluvia from the air; and as they likewiſe increaſe in bulk by admitting water to their roots, and more ſo when the water contains much of that kind of effluvium than when it contains leſs: ſo we would conclude, that the nouriſhment received by the roots of plants is of the ſame kind with that received by their leaves; and that this food may be given them in greater plenty than they naturally receive it, by impregnating the air which ſurrounds them, or the water which moiſtens them, with a greater quantity of putrid matter than what they contain in a natural ſtate.

SECT. II. *The foregoing Theory confirmed from conſiderations on the nature of vegetable Mould, and the different kinds of Manure found proper for fertilizing the Soil.*

6 All kinds of earth not equally proper for nouriſhing vegetables.

Though plants will grow on any kind of earth, and flouriſh vigorouſly, if plentifully ſupplied with water; yet ſome kinds of ſoils are found much more proper for ſupplying them with nouriſhment than others.—We cannot, indeed, allow the inferences to be quite fair which ſome would draw from experiments on plants ſet in mere ſand, &c.; viz. that the earth is of no other uſe to vegetation than to afford a proper ſupport to the plant, that it be not eaſily moved out of its place; becauſe the experiments made on ſingle vegetables are always performed in or very near houſes, where the air is by no means ſo pure as in the open fields, and conſequently where they have an opportunity of receiving as much nouriſhment from the air as may compenſate the want of what they would have derived from the earth if planted in a rich ſoil. Lord Kames, in the Gentleman Farmer, mentions an experiment wherein a pea was planted on ſome cotton ſpread on water, in a phial. It ſprung, and puſhed roots through the cotton into the water. The plant grew vigorouſly, and, at the time of his writing the experiment, carried large pods full of ripe ſeed.—From this experiment, or others of a ſimilar kind, however, a farmer would not be thought to act very judiciouſly, who ſhould conclude that nothing more was requiſite to produce a plentiful crop, than to keep his fields conſtantly ſoaking with water, and apply his labour only for that purpoſe, without regarding either tillage, manure, or the difference of ſoils. Experience has abundantly ſhown, that by certain operations performed on the earth itſelf, it is rendered much more capable of ſupplying vegetables with plenty of nouriſhment than if ſuch operations were omitted; and that ſome kinds of ſoils cannot without certain additions be rendered ſo fit for this purpoſe as others; and this is what conſtitutes the difference between a *rich* and a *poor* ſoil.

7 Of the true vegetable earth.

That ſpecies of earth which is capable of ſupplying the vegetable kingdom with nouriſhment in the greateſt plenty, is found beſt in well cultivated gardens. It is not, hovever, even in theſe, found in perfect purity; being conſtantly mixed with greater or leſs proportions of ſand, ſmall ſtones, &c. It can be had by itſelf, and entirely ſeparated from all other ſubſtances, only by ſuffering vegetable or animal bodies to putrefy. By undergoing this operation, they are at laſt reſolved into a kind of earth, which appears perfectly the ſame from whatever ſubſtance it is produced. Of this earth Dr Lewis gives us the following characters. It is indiſſoluble in acids, ſomewhat tenacious when moiſtened with water, friable when dry, and acquires no additional hardneſs in the fire.—The chemiſtry of nature, and that of art, however, are ſo very diſſimilar, that an account of the chemical properties of this earth can be but of very little ſervice to the practice of agriculture; however, to thoſe above mentioned we may add, that when it is diſtilled with a violent fire, a volatile alkaline ſpirit, and fœtid oil, ſimilar to thoſe of hartſhorn or other animal ſubſtances, are obtained.

8
This earth impregnated with putrid effluvia.

As the volatile alkali is known to be produced in great plenty by diſtilling putrid ſubſtances either animal or vegetable, the obtaining an alkaline ſpirit from this kind of earth is a ſtrong argument of its being much impregnated with the putrid effluvium, which we have already mentioned as the proper vegetable food contained in the air and water. Indeed, conſidering that this kind of earth is produced by putrefaction, it is next to an impoſſibility that it ſhould not be impregnated with putrid ſteams, as much as earth can be; and if the earth which is moſt impregnated with theſe ſteams is found to afford the greateſt quantity of nouriſhment to vegetables, we have from thence an additional proof that they live on the putrid matter emitted from dead animals and vegetables like themſelves.

9
Earth is capable of abſorbing putrid ſteams in prodigious quantities.

That we may be the more aſcertained of this, it muſt be conſidered, that the earth, which undoubtedly is the great ſource of nouriſhment to vegetables, is capable of abſorbing putrid effluvia more powerfully, or at leaſt in much greater quantity, before it is ſaturated, than either the air or water. The practice of burying dead bodies is an undeniable proof of this. They are laid but a ſmall depth under ground; yet the abominable ſtench emitted by the carcaſe is retained in the earth, ſo that it never penetrates in ſuch a manner as to be offenſive. That earth may be ſaturated with this putrid matter, as well as air or water, is very certain; and, in caſe of ſuch a ſaturation, no doubt either of theſe will take up the ſuperfluous quantity, and become noxious: but unleſs the earth is fully ſaturated, both of them will depoſite part of what they themſelves contain in the earth, and by that means become more ſalutary than they were before.

10
Agreeable odour emitted by moiſt earth.

That earth is capable of attracting putrid effluvia from the air, perhaps, may not be ſo readily granted; and indeed we know of no experiment whereby it can be ſhown that putrid air is made ſalutary by having any kind of earth agitated in it: but if we conſider the exceeding great ſalubrity of the air in the country, and the healthineſs of thoſe who follow the plough or are employed in digging the ground, we muſt at leaſt allow, that when the ground is turned up, it communicates no kind of noxious quality to the air; which it would certainly do, if it emitted a putrid effluvium. So far from this, the ſmell of moiſt earth is always agreeable and wholeſome; and here we have the ſatisfaction to find our theory ſomewhat confirmed by the celebrated Baron van Swieten, late phyſician to the empreſs of Hungary.

"Phyſicians," ſays he, "uſually adviſe their patients to ruſtication, not only that they may enjoy a pure and freely circulating air; but that, as their ſtrength increaſes, they may, diſengaged from all care, exerciſe their body by the ſlighter labours of agriculture, and other country amuſements.

"There may perhaps be another cauſe why ruſtication will be of benefit in conſumptions. It is well known, that, after ſome days drought, on the falling of rain that moiſtens the earth, there ariſes a grateful ſmell, which we are all ſenſible of; and this is commonly attributed to the vegetables, which before ſapleſs, but now refreſhed by rain, perſpire more copiouſly. But Reaumur obſerved, that a like fragrancy is alſo perceptible after rain when the corn has been cut down in the fields, where there only remains dry ſtubble: and examining the matter more particularly, he found that dry earth is without ſmell, but as ſoon as it is moiſtened to the degree of having the conſiſtence of ſoftiſh pap, it then diffuſes a ſtrong ſmell; but if more water is added, the ſmell is diminiſhed, nay even quite diſſipated. Neither does it ſeem an eaſy matter to exhauſt that power of producing ſmells which the earth is poſſeſſed of. Every day, during a fortnight, he made cakes of moiſtened earth; and having dried and wetted them over again, he could not perceive that the earth was leſs fragrant after all theſe repeated experiments, if it was again wetted. He further obſerved, that this fragrancy does not diffuſe itſelf to any thing at a great diſtance, without being much diminiſhed, and ſoon entirely gone.—It has been obſerved, that this expiration of the earth ceaſes if thunder and ſtorms ſoon follow: while they continue, it begins to return; and when over, the ſame fragrancy of the earth for ſome hours affects the ſmell of a man as he walks along over a conſiderable tract of ground. There is no one, I believe, but has ſometimes made this obſervation; and hence the earth, when moiſtened to a certain degree, ſeems to exhale fragrant odours, and indeed various in various places, as we are ſenſible of from their diverſity. They are for the moſt part of a ſalubrious quality; as ſome perſons quite faint and languid in the ſummer-heats perceive themſelves wonderfully refreſhed, whilſt, after rain, they ſnuff up the fragrant odour. In ſome places thoſe effluvia are perhaps bad, and may be the cauſes of diſeaſes."

This property of emitting a fragrant ſmell is likewiſe taken notice of by Dr Home in his Principles of Agriculture and Vegetation. Some phyſicians have preſcribed a bath of earth for the cure of conſumptive patients; and Dr Solano de Luque was of opinion, that the earth had the property of abſorbing contagious miaſmata into it: but whether it can abſorb theſe miaſmata from living bodies or not, it certainly can abſorb them from dead ones; for a piece of putrid meat will be much ſweetened by lying for a ſhort time in the ground.

11
Power of tranſmutation in the earth aſſerted.

From all this we cannot indeed infer, that putrid air is ſweetened by mere earth; but we diſcover what is perhaps more important, namely, that though earth is the common receptacle of all putrid matters both animal and vegetable, there is a change made on them when in it, which cannot be made either by air or water. Thus, if the carcaſe of a ſmall animal is left to putrefy in the air, it becomes exceedingly offenſive, and continues ſo from firſt to laſt. The ſame thing happens if it is left to putrefy in water. But, in earth, the caſe is quite different. After the carcaſe is conſumed, the earth which has imbibed all the putrid ſteams, inſtead of exhaling an offenſive odour, diffuſes an agreeable one; and thus we may ſee that it is endued with a power no leſs remarkable than that of attraction or repulſion, and which we may diſtinguiſh by the name of *tranſmutation*. With regard to water, the caſe is more evident; for the moſt putrid water will be ſweetened by percolation through earth, or even running in a channel for ſome time on its ſurface; but if it contains any impurities of the ſaline kind, they will not be ſeparated, or at leaſt in very ſmall quantity.

12
Attraction inſufficient to ſolve the phenomena of vegetation.

The exiſtence of ſuch a power as that of tranſmutation we will be obliged to own, whatever we imagine the vegetable food to conſiſt of: for it is impoſſible to ſolve the phenomena of vegetation by attractions and repulſions. If we ſuppoſe the vegetable food to be ſalt, let us attract and repel ſalt as we will, it remains ſalt from firſt to laſt. Let us ſuppoſe it water, the caſe is the ſame; and, by mere attraction, nothing but maſſes of ſalt, or pools of water, could be produced. The caſe is the ſame on our own hypotheſis; for, ſuppoſing plants compoſed of the putrid effluvia of others, and of dead animals, if nature was endued with no other power than attraction or repulſion, the vegetable would neceſſarily be a corrupted maſs like that of which it was compoſed.—This power, as we have already ſeen, reſides only in the earth, and in the vegetables themſelves; air and water can indeed act as powerful ſolvents, but cannot transform or compound.

13
Confirmation of the above theory from the different operations of agriculture

We muſt next conſider the nature of thoſe different operations, which, from time immemorial, have been performed on the earth, in order to cauſe it produce the greateſt crops of vegetables. If all of theſe ſhall be found conſpiring to one general purpoſe, then the ſhorteſt and moſt eaſy method of attaining that purpoſe is undoubtedly the moſt proper to be practiſed in agriculture, whether it hath been as yet put in execution or not. Theſe are,

14
Fallowing

1. *Frequent ploughing, or fallowing.* The immediate conſequences of this is to expoſe different quantities of the ſoil to the action of the air and ſun, which will not fail to exert their ſolvent powers upon it. In conſequence of this action, the earth is partly reduced to powder; many of the roots of vegetables, with which it always abounds, are diſſolved and putrefied: and the earth produced from them mixes with the reſt, as well as the effluvia they emit during their diſſolution. The earth ſoon begins again to exert its prolific powers, and a crop of vegetables is produced. By a repetition of the ploughing, theſe are turned with their roots upwards, are expoſed to the ſolvent powers of the air and light; in conſequence of which they die, are putrefied, and more of the native ſoil is reduced to powder, and mixed with them. By a frequent repetition of this proceſs, the ſoil becomes vaſtly more tender, and approaches to the nature of garden-mould, and its fertility is conſiderably increaſed.

15
The capacity of a ſoil to retain water not increaſed by fallowing.

Lord Kames is of opinion, that the reaſon of the fertility of any ſoil being increaſed by fallowing, is, that its capacity of retaining water is increaſed. But this cannot be admitted; for ſo far from being more diſpoſed to retain water by its pulveriſation, the ſoil is evidently more diſpoſed to part with it, either by evaporation, or by ſuffering the moiſture to percolate thro' it. In this reſpect it is far inferior to clay; for though dry garden-mould abſorbs water much more quickly than clay, it alſo dries much ſooner, and thus all the advantage is loſt.

16
Oils and ſalts not the true vegetable food.

To thoſe who reckon the food of vegetables to conſiſt of oils or ſalts, the operation of fallowing ground muſt appear an uſeleſs one, as it can tend neither to produce oils nor ſalts, but to deſtroy them. As its utility, however, cannot be denied, the favourers of this theory imagine, that the ground, by repeated operations of this kind, is fitted for attracting the nitrous ſalts from the air: but it is found, that theſe ſalts cannot be attracted by earth, or any other ſubſtance, even when expoſed for a great length of time to the air with a view to produce ſalt-petre; which gives a ſtrong ſuſpicion againſt their exiſtence; and even if nitre is mixed with the ſoil, it is found to be detrimental, and will kill or poiſon plants inſtead of nouriſhing them.

17
Overflowing the ſoil with water.

2. *Overflowing the ground with water.*—This is found prodigiouſly to increaſe the fertility of any ſoil. It is well known how much Egypt owes to the annual overflowing of the Nile; and even in this country the overflowing of any ground is found to be attended with great advantage. This is practiſed by Mr Bakewell of Leiceſterſhire, famous for his improvements in the breed of cattle; and he finds it fully to anſwer an annual manuring of any other ſort. It is alſo recommended by Mr Anderſon of Monkſhill, in his Eſſays on Agriculture.

18
Reaſons of the increaſe of fertility by the overflowing.

The fertilizing quality of water will eaſily be accounted for on the ſame principles. When grown vegetables are covered with water, their growth, however vigorous before, is immediately ſtopt, unleſs they be of the aquatic kind: they die, are diſſolved, and putrefied; in which caſe, their finer parts are undoubtedly abſorbed by the earth: and thus the *floating*, as it is called, of fields with water, anſwers the purpoſe of fallowing, with very little trouble. This is not all: for ſtagnating water always depoſites a ſediment, which mixing with the diſſolved parts of the vegetables all over the field, forms an excellent manure; and when the water is allowed to run off, the heat of the ſun ſoon brings the higheſt degree of putrefaction on the dead vegetables; the effluvia of which, mixing with the mud depoſited from the water, makes it exceedingly rich.

19
Oils & ſalts cannot be the vegetable food.

Upon the ſuppoſition of oily and ſaline food for vegetables, this operation muſt certainly be prejudicial; for nothing can ſo effectually deprive any ſubſtance of ſalt as ſteeping it in water. Neither will water either depoſite oil from itſelf, or ſuffer it to mix with the ground if accidentally brought to it; nay, though a field were previouſly impregnated with oil, upon overflowing it with water, great part of the oil would be ſeparated, and riſe to the top: ſo that, in either caſe, this operation could not fail to impoveriſh land rather than enrich it; and as vegetables are found to be ſupplied with food in plenty by an operation which muſt undoubtedly tend to take away both oils and ſalts from them, we cannot help thinking this a demonſtration, that their food is compoſed neither of oil nor ſalt.

20
Of manures, and their operation.

3. *Manuring*, or mixing the ſoil with different ſubſtances.—We ſhall here confine ourſelves to thoſe which are of undoubted efficacy, and have their credit eſtabliſhed by long experience. Theſe are, 1. lime, chalk, marle, ſhells, or other earths, called by the chemiſts *calcareous earths*; 2. ſoot; 3. aſhes: 4. dung of different kinds.—(1.) The lime, chalk, marle, and ſhells, are all found to be of the ſame nature. The marle differs from the reſt, only in having a mixture of clay

along with its calcareous part. Theſe contain neither ſalt nor oil of any kind; they readily imbibe water, and as readily part with it. Quicklime, indeed, retains water very obſtinately: but ſuch lime as is laid upon the ground ſoon returns to the ſame ſtate in which it originally was; and powdered limeſtone is found to anſwer as well for the purpoſes of manure as that which has been burnt; ſo that here we may conſider them all as ſubſtances of the ſame claſs.—If any of theſe ſubſtances are mixed with dead animal or vegetable bodies, they remarkably quicken their diſſolution and corruption, as appears from Sir John Pringle's experiments on putrefaction. When mixed with the ſoil, therefore, they muſt unboubtedly exert their powers on ſuch ſubſtances as they find there, in the ſame manner as they do on others; that is, they muſt haſten their diſſolution and putrefaction, and give the pure vegetable mould an opportunity of abſorbing their putrid ſteams, and conſequently of being fertilized by it in the ſame manner as by putrid ſubſtances of any kind. (2.) Thoſe who contend for oily and ſaline principles in the vegetable food, avail themſelves of the uſefulneſs of ſoot as manure; which is not only oily of itſelf, but affords a great quantity of volatile ſalt, along with ſome neutral ſal-ammoniac. It muſt be remembered, however, that not an atom either of volatile ſalt or ſal-ammoniac can be extracted from ſoot without a conſiderable heat, which no ſoil can give, nor could any vegetable bear. Neither doth its oil appear without a great degree of heat: and though it feels ſomewhat unctuous to the touch, this is but a mere deception; for no true oil, capable of floating on water, can be obtained from ſoot without diſtillation. It is impoſſible, therefore, that ſoot can act upon the ſoil either as an oily or a ſaline ſubſtance; how far it is capable of diſſolution by putrefaction, or being otherwiſe converted into an earth, hath not yet been determined by experiments; but as it yields, on diſtillation, the ſame principles which are obtained from animal or putrefied vegetable ſubſtances, it is probable that ſoot enriches the ground in the ſame manner that they do. (3.) The uſe of aſhes in manure is likewiſe urged as an argument for the food of vegetables being of a ſaline nature; as it is known, that the common alkaline ſalts are procured by lixiviating the aſhes of wood and other vegetables. Experience, however, ſhows us, that aſhes are no leſs fit for manure after the ſalt is extracted from them than before. Indeed, if there be any difference, it is in favour of the waſhed aſhes. The alkali itſelf, though in Sir John Pringle's experiments it was found to be *antiſeptic*, or a reſiſter of putrefaction, is nevertheleſs a powerful diſſolvent; and as it muſt ſoon loſe its alkaline properties when mixed with the earth, in conſequence of the univerſal exiſtence of the vitriolic acid, thoſe ſubſtances which it has diſſolved will be more diſpoſed to putrefaction than before, and conſequently tend to fertilize the ground in the manner we have already deſcribed. The waſhed aſhes are *ſeptics*, or promoters of putrefaction, and conſequently act in the ſame manner as chalk or lime-ſtone. (4.) All kinds of dung are ſo much diſpoſed to putrefaction, that it is difficult to imagine any other way in which they can be ſerviceable to vegetation than by their putrid effluvia.—People indeed may dream of imaginary ſalts in dung; but if they knew or conſidered the difficulty of procuring ſalt of any kind from dung, they would probably alter their ſentiments. The volatile ſalts procured from this as well as other animal matters, are mere creatures of the fire: putrid urine produces them indeed without heat, but ſcarce any other animal ſubſtance. Nevertheleſs, other putrid ſubſtances will fertilize the ground as well as urine, and therefore muſt act in ſome other way than by their ſalts. Though Dr Prieſtley's experiments had never been made, we could have formed no other rational ſuppoſition concerning the manner in which putrid ſubſtances fertilize the earth, than what we have already done; but as he has ſhown that vegetables are prodigiouſly increaſed in bulk by the mere contact of theſe putrid ſteams, where no ſaline ſubſtances could have acceſs to them, we cannot help thinking this a deciſive experiment concerning the manner in which the ground is fertilized by manuring with dung or other putrid ſubſtances.

21
Effects of ſaline ſubſtances on growing vegetables.

We ſhall conclude this part of the ſubject with an account of ſome experiments concerning the effects of ſaline ſubſtances on the growth of vegetables. The following are related by Lord Kames, in his Gentleman Farmer.—"A number of Jeruſalem artichokes were ſet in pots filled with pure ſand. One plant was kept as a ſtandard, being nouriſhed with water only. Other plants of the ſame kind were nouriſhed with water in which ſalt of tartar, a fixed alkali, was diſſolved. Theſe grew more vigorouſly than the ſtandard plant: but, by reiterated waterings, there came to be ſuch an accumulation of the fixed alkali among the ſand, as to make the plants decay, and at laſt to die. Some plants were nouriſhed with water in which ſal-ammoniac, a volatile alkali, was diſſolved. Theſe grew alſo well for ſome time; but, like the former, were deſtroyed by frequent reiterations of it. Weak lime-water promoted the growth of its plants more than common water. But water completely ſaturated with quicklime, proved more noxious than that which contained a fixed alkali, though leſs than that which contained a ſolution of volatile alkali.—Urine promoted, for a long time, the growth of its plants; and *the moſt putrid appeared to have the ſtrongeſt effect;* but at laſt it totally deſtroyed them. *Water impregnated with putrid animal and vegetable ſubſtances, did more effectually promote the growth of its plants than any other ſolution; and in every ſtage of the proceſs appeared to be ſalutary.*"

22
Common ſalt ineffectual as a manure.

With regard to other ſaline ſubſtances, there are not many experiments which can be depended upon concerning their qualities as a manure. Mr Anderſon relates an experiment made with common ſalt; the ſucceſs of which, we apprehend, may juſtly enough be taken as a ſpecimen of what is to be expected from manures of a ſimilar kind.—He marked out a circle of ſix feet diameter in the middle of a graſs-field, which he diſtinguiſhed by driving a ſtake in its centre. All over this circle he ſtrewed common ſalt, which, about the ſtake lay near an inch thick on the ground. In this ſtate he left it to the operations of nature. The graſs ſprung up as uſual, neither better nor worſe about the ſtake than in the reſt of the field, and the place where the circle was could be diſtinguiſhed only by the ſtake, which was left there for ſome years.

Upon theſe experiments we need make very few obſervations. They are ſo much in favour of our theory, that they ſeem made on purpoſe to confirm it. The fixed alkali employed in Lord Kames's experiments would firſt exert its ſolvent powers on ſuch heterogeneous ſubſtances as it met with among the ſand; for no ſand can be ſuppoſed to be perfectly free of theſe. As long as it exerted its ſtrength on theſe only, the plant would thrive, for the reaſons we have already mentioned; but having exhauſted the ſmall quantity of ſubſtances contained in the ſand, it would next attack the plant itſelf, which conſequently would decay and die. The ſame effects would neceſſarily follow in a greater degree from ſtrong lime-water which contains lime in its cauſtic ſtate; for this is a more powerful ſolvent than fixed alkali itſelf, and would not fail to deſtroy every thing it touched; nor is it at all improbable that the plant would ſeem to grow vigorouſly by the diſſolution of part of its own roots, more nouriſhment being by this means given to thoſe which remained ſound.—Volatile alkali is likewiſe a powerful ſolvent: but, by reaſon of its volatility, would exert its cauſtic power on the plant ſooner than either lime or fixed alkali; and accordingly it ſeems to have been the moſt deſtructive of any thing that was tried. It ſeems owing to this, that putrid urine at laſt deſtroyed the plants whoſe growth it ſo long promoted; while water impregnated with other putrid mattets, which yield no volatile alkali without heat, proved always ſalutary.

23
End to be kept in view by a farmer.

From all this, we may draw the following general concluſion, viz. That the principal end which a farmer ought to keep in view, is to impregnate his ground as much as poſſible, with ſubſtances which either actually contain putrid matter, or which are in their own nature *ſeptic*, or promoters of putrefaction. To impregnate the air with putrid effluvia is impoſſible; and tho' it could be done, would be highly dangerous; for however ſalutary ſuch effluvia may be to vegetables, nothing can be more fatal to mankind. The putrid ſubſtances, therefore, can only be uſed by mixing them with the earth; and in whatever manner they can be moſt perfectly, and in the greateſt quantity, mixed with the ſoil, there the beſt crops may be expected.

Sect. III. *Of the different Soils, and the Manures moſt proper for each.*

24
Richeſt ſoils muſt at laſt be impoveriſhed.

According to the theory we have juſt now laid down, the richeſt ſoil muſt be that which contains the greateſt quantity of putrid matter, either animal or vegetable; and ſuch is the earth into which animal and vegetable ſubſtances reſolve themſelves. Was this earth to be had in perfection, it is evident it could not ſtand in need of manure of any kind, or be the leaſt enriched by it; for containing an immenſe quantity of putrid matter, it would freely communicate it to the vegetables planted in it, which would grow in the moſt luxuriant manner, without requiring any other care than that of keeping them conſtantly ſupplied with water. If we ſuppoſe the crop left upon the ground to putrefy and mix with the earth as before, the ſoil will contain the ſame quantity of putrid matter the ſecond year that it did the firſt, and be equally prolific: but if the crop is removed to another place, and nothing is brought back to enrich the ground in its ſtead, it is evident, that it will contain leſs of the true vegetable food the ſecond year than it did the firſt, and conſequently be leſs prolific. For ſome time, however, the difference will not be perceptible: and people who are in poſſeſſion of ſuch ground may imagine that they enjoy a ſoil which will be perpetually fertile; but long experience has taught us, that the richeſt ſoils will at laſt be exhauſted by repeated cropping without manure, as according to our theory they ought to be.

Where the ground has been ſuffered to remain uncultivated for many ages, producing all that time ſucculent plants which are eaſily putrefied, and trees, the leaves of which likewiſe contribute to enrich the ground by their falling off and mixing with it, the ſoil will in a manner be totally made up of pure vegetable earth, and be the richeſt, when cultivated, that can be imagined. This is the caſe with the lands of America. They had remained uncultivated perhaps ſince the creation, and were endowed with an extraordinary degree of fertility; it is nevertheleſs certain that ſuch grounds as have been long cultivated, are ſo much exhauſted, as to be not much better than the generality of cultivated grounds in France or England. Here, then, we have an example of one ſpecies of poor ſoil; namely, one that has been formerly very rich, but has been deprived, by repeated cropping, of a great part of the vegetable food it contained. The farmer who is in poſſeſſion of ſuch ground, would no doubt willingly reſtore it to its former ſtate; the preſent queſtion is, What muſt be done in order to obtain this end? We have mentioned ſeveral kinds of manures which long practice has recommended as ſerviceable for improving ground: we ſhall ſuppoſe the farmer tries lime, or chalk; for, as we have already ſeen, their operations upon the ſoil muſt be preciſely the ſame. This ſubſtance, being of a ſeptic nature, will act upon ſuch parts of the ſoil as are not putrefied, or but imperfectly ſo; in conſequence of which, the farmer will reap a better crop than formerly. The ſeptic nature of the lime is not altered by any length of time. In ploughing the ground, the lime is more and more perfectly mixed with it, and gradually exerts its power on every putreſcible matter it touches. As long as any matter of this kind remains, the farmer will reap good crops: but when the putreſcible matter is all exhauſted, the ground then becomes perfectly barren; and the cauſtic qualities of the lime are moſt unjuſtly blamed for *burning* the ground, and reducing it to a *caput mortuum;* while it is plain, the lime has only done its office, and made the ſoil yield all that it was capable of yielding.

25
One ſpecies of poor ſoil deſtroyed by lime.

26
A ſpecies of poor ſoil meliorated by lime.

When ground has been long uncultivated, producing all the time plants, not ſucculent, but ſuch as are very difficultly diſſolved, and in a manner incapable of putrefaction; there the ſoil will be exceſſively barren, and yield very ſcanty crops, tho' cultivated with the greateſt care. Of this kind are thoſe lands covered with heath, which are found to be the moſt barren of any, and the moſt difficultly brought to yield good crops. In this caſe lime will be as ſerviceable, as it was detrimental in the other: for by its ſeptic qualities, it will continually reduce more and more of the ſoil to a putrid ſtate; and thus there will be a conſtant ſucceſſion of better and better crops, by the continued uſe of lime when the quantity firſt laid on has exerted all its force. By a continued uſe of this manure, the ground will be gradually brought nearer and nearer to the nature of garden-mould; and, no doubt, by proper care, might be made as good as any; but it will be as great a miſtake to imagine, that, by the uſe of lime, this kind of ſoil may be rendered perpetually fertile, as to think that the other was naturally ſo; for though lime enriches this ſoil, it does ſo not by adding vegetable food to it, but by preparing what it already contains; and when all is properly prepared, it muſt as certainly be exhauſted as in the other caſe.

27 Poor ſoils, how reſtored.

Here, then, we have examples of two kinds of *poor* ſoils; one of which is totally deſtroyed, the other greatly improved, by lime, and which therefore require very different manures; lime being more proper for the laſt than dung; while dung, being more proper to reſtore an exhauſted ſoil than lime, ought only to be uſed for the firſt. Beſides dunging land which has been exhauſted by long cropping, it is of great ſervice to let it lie fallow for ſome time: for to this it owed its original fertility; and what gave the fertility originally, cannot fail to reſtore it in ſome degree.

By attending to the diſtinction between the reaſons for the poverty of the two ſoils juſt now mentioned, we will always be able to judge with certainty in what caſes lime is to be uſed, and when dung is proper. The mere poverty of the ſoil is not a criterion whereby we can judge; we muſt conſider what hath made it poor. If it is naturally ſo, we may almoſt infallibly conclude, that it will become better by being matured with lime. If it is *artificially* poor, or exhauſted by continual cropping, we may conclude that lime will entirely deſtroy it.—We apprehend, that it is this *natural* kind of poverty only which Mr Anderſon ſays, in his Eſſays on Agriculture, may be remedied by lime; for we can ſcarce think that experience would direct any perſon to put lime upon land already exhauſted. His words are,

28 Mr Anderſon's opinion concerning lime.

> “ Calcareous matters act as powerfully upon land that is naturally poor, as upon land that is more richly impregnated with thoſe ſubſtances that tend to produce a luxuriant vegetation.”

“ Writers on agriculture have long been in the cuſtom of dividing manures into two claſſes, viz. *Enriching* manures, or thoſe that tended directly to render the ſoil more prolific, however ſterile it may be; among the foremoſt of which was dung: *Exciting* manures, or thoſe that were ſuppoſed to have a tendency to render the ſoil more prolific, merely by acting upon thoſe enriching manures that had been formerly in the ſoil, and giving them a new ſtimulus, ſo as to enable them to operate anew upon that ſoil which they had formerly fertilized. In which claſs of ſtimulating manures, *lime* was always allowed to hold the foremoſt place.

“ In conſequence of this theory, it would follow, that lime could only be of uſe as a manure when applied to rich ſoils—and when applied to poor ſoils, would produce hardly any, or even perhaps hurtful, effects.

“ I will frankly acknowledge, that I myſelf was ſo far impoſed upon by the beauty of this theory, as to be hurried along with the general current of mankind, in the firm perſuaſion of the truth of this obſervation, and for many years did not ſufficiently advert to thoſe facts that were daily occurring to contradict this theory.—I am now, however, firmly convinced, from repeated obſervations, that lime, and other calcareous manures, produce a much greater *proportional* improvement upon poor ſoils than ſuch as are richer.—And that lime alone, upon a poor ſoil, will, in many caſes, produce a much greater and more laſting degree of fertility than dung alone.”

Thus far Mr Anderſon's experience is exactly conformable to the theory we have laid down, and what ought to happen according to our principles. He mentions, however, ſome facts which ſeem very ſtrongly to militate againſt it; and indeed he himſelf ſeems to proceed upon a theory altogether different.

29 Query concerning the nature of a proper ſoil.

> “ Calcareous matter alone (ſays he) is not capable of rearing plants to perfection;—mould is neceſſary to be mixed with it in certain proportions, before it can form a proper ſoil. It remains, however, to be determined, what is the due proportion of theſe ingredients for forming a proper ſoil.

“ We know that neither chalk, nor marle, nor lime, can be made to nouriſh plants alone; and ſoils are ſometimes found that abound with the two firſt of theſe to a faulty degree. But the proportion of calcareous matter in theſe is ſo much larger than could ever be produced by art, where the ſoil was naturally deſtitute of theſe ſubſtances, that there ſeems to be no danger of erring on that ſide. Probably it would be much eaſier to correct the defects of thoſe ſoils in which calcareous matters ſuperabound, by driving earth upon them as a manure, than is generally imagined; as a very ſmall proportion of it ſometimes affords a very perfect ſoil. I ſhall illuſtrate my meaning by a few examples.

30 Examples of ſoil perpetually fertile.

“ Near Sanſide, in the county of Caithneſs, there is a pretty extenſive plain on the ſea-coaſt, endowed with a moſt ſingular degree of fertility. In all ſeaſons it produces a moſt luxuriant herbage, although it never got any manure ſince the creation; and has been for time immemorial ſubjected to the following courſe of crops.

> “ 1. Bear, after once ploughing from graſs, uſually a good crop.
>
> “ 2. Bear, after once ploughing, a better crop than the firſt.
>
> “ 3. Bear, after once ploughing, a crop equal to the firſt.
>
> “ 4. 5. and 6. Natural graſs, as cloſe and rich as could be imagined, might be cut, if the poſſeſſor ſo inclined, and would yield an extraordinary crop of hay each year.

“ After this the ſame courſe of cropping is renewed. The ſoil that admits of this ſingular mode of farming, appears to be a pure incoherent ſand, deſtitute of the ſmalleſt particle of vegetable mould; but, upon examination, it is found to conſiſt almoſt entirely of broken ſhells: the fine mould here bears ſuch a ſmall proportion to the calcareous matter, as to be ſcarce perceptible, and yet it forms the moſt fertile ſoil that ever I yet met with.

“ I have ſeen many other links (downs) upon the ſea-ſhore, which produced the moſt luxuriant herbage, and the cloſeſt and ſweeteſt pile of graſs, where they conſiſted of ſhelly ſand; which, without doubt, derive their extraordinary fertility from that cauſe.

“ A very remarkable plain is found in the iſland of Jir-eye, one of the Hebrides. It has been long employed as a common; ſo that it has never been diſturbed by the plough, and affords annually the moſt luxuriant crop of herbage, conſiſting of white clover, and other valuable paſture-graſſes, that can be met with any where. The ſoil conſiſts of a very pure ſhelly ſand.

"From theſe examples, I think it is evident, that a very ſmall proportion of vegetable mould is ſufficient to render calcareous matter a very rich ſoil. Perhaps, however, a larger proportion may be neceſſary when it is mixed with clay than with ſand; as poor chalky ſoils ſeem to be of the nature of that compoſition."

To theſe examples brought by Mr Anderſon, we may add ſome of the ſame kind mentioned by Lord Kames. His lordſhip having endeavoured to eſtabliſh the theory of water being the only food of plants, though he himſelf frequently deviates from that theory, yet thinks it poſſible, upon ſuch a principle, to make a ſoil perpetually fertile.

"To recruit (ſays he) with vegetable food, a ſoil impoveriſhed by cropping, has hitherto been held the only object of agriculture. But here opens a grander object, worthy to employ our keeneſt induſtry, that of making a ſoil perpetually fertile. Such ſoils actually exiſt; and why ſhould it be thought, that imitation here is above the reach of art? Many are the inſtances of nature being imitated with ſucceſs. Let us not deſpair while any hope remains; for invention never was exerciſed upon a ſubject of greater utility. The attempt may ſuggeſt proper experiments: it may open new views: and if we fail in equalling nature, may we not, however, hope to approach it? A ſoil perpetually fertile muſt be endowed with a power to retain moiſture ſufficient for its plants; and at the ſame time muſt be of a nature that does not harden by moiſture. Calcareous earth promiſes to anſwer both ends: it prevents a ſoil from being hardened by water; and it may probably alſo invigorate its retentive quality. A field that got a ſufficient doſe of clay-marle, carried above 30 ſucceſſive rich crops, without either dung or fallow. Doth not a ſoil ſo meliorated draw near to one perpetually fertile? Near the eaſt ſide of Fife, the coaſt for a mile inward is covered with ſea-ſand, a foot deep or ſo; which is extremely fertile, by a mixture of ſea-ſhells reduced to powder by attrition. The powdered ſhells, being the ſame with ſhell-marle, make the ſand retentive of moiſture; and yet no quantity of moiſture will unite the ſand into a ſolid body. A ſoil ſo mixed, ſeems to be not far diſtant from one perpetually fertile. Theſe, it is true, are but faint eſſays; but what will not perſeverance accompliſh in a good cauſe?"

31
Inconſiſtency in Lord Kames's theory.

Having thus, in a manner, poſitively determined with Mr Anderſon, that no doſe of calcareous matter can poſſibly be too great, we cannot help owning ourſelves ſurpriſed on finding his Lordſhip expreſſing himſelf as follows: "An over doſe of ſhell-marle, laid perhaps an inch, and an inch and a half, or two inches thick, produces, for a time, large crops: but at laſt it renders the ſoil a *caput mortuum*, capable of neither corn nor graſs; of which there are too many inſtances in Scotland; the ſame probably would follow from an over-doſe of clay-marle, ſtone-marle, or pounded lime-ſtone."—To account for this, he is obliged to make a ſuppoſition directly contrary to his former one; namely, that calcareous matter renders the ſoil *incapable* of retaining water. This phenomenon, however, we think is ſolved upon the principles firſt laid down, in a ſatiſfactory manner, and without the leaſt inconſiſtency.

32
Perpetual fertility of ſoils chimerical.

As to rendering ſoils perpetually fertile, we cannot help thinking the attempt altogether chimerical and vain. There is not one example in nature of a ſoil perpetually fertile, where it has no ſupply but from the air, and the rain which falls upon it. The above recited examples can by no means be admitted as proofs of perpetual fertility. We know, that the graſs on the banks of a river is much more luxuriant than what grows at a diſtance: the reaſon is, that the water is attracted by the earth, and communicates its fertilizing qualities to it; but was the river to be dried up, the graſs would ſoon become like the reſt. Why ſhould not the ocean have the ſame power of fertilizing plains near its ſhores, that rivers have of fertilizing ſmall ſpots near their banks? We ſee, however, that it hath not; for the ſea-ſhores are generally ſandy and barren. The reaſon of this is, that the waters of the ocean contain a quantity of looſe acid;* and this acid is poiſonous to plants; but abſtracting this acid part, we heſitate not to affirm, that ſea-water is more fertilizing than river-water. It is impoſſible to know how far the waters of the ocean penetrate under ground through a ſandy ſoil. Where they meet with nothing to abſorb their acid, there the ground is quite barren; but in paſſing through an immenſe quantity of broken ſhells, the calcareous matter, we are very certain, will abſorb all the acid; and thus the ſoil will be continually benefited by its vicinity to the ocean. All the above fields, therefore, are evidently ſupplied with nouriſhment from the ocean: for if the ſalt-water has ſufficient efficacy to render fields which are in its neighbourhood barren, why ſhould it not render them fertile when the cauſe of barrenneſs is removed from its waters?

After all, the field in Caithneſs, mentioned by Mr Anderſon, ſeems to have been perpetually fertile only in graſs; for though the ſecond year it carried a better crop of bear than it did the firſt, yet the third year the crop was worſe than the ſecond, and only equal to the firſt. Had it been ploughed a fourth time, the crop would probably have been worſe than the firſt. Ground is not near ſo much exhauſted by graſs as corn, even though the crop be cut, and carried off; and ſtill leſs, if it only feeds cattle, and is manured by their dung; which appears to have been the caſe with this field. Lord Kames, indeed, mentions fields in Scotland, that, paſt memory, have carried ſucceſſive crops of wheat, peaſe, barley, oats, without a fallow, and without a manure; and particulariſes one on the river Carron, of nine or ten acres, which had carried 103 crops of oats without intermiſſion, and without manure; but as we are not acquainted with any ſuch fields, nor know any thing about their particular ſituations, we can form no judgment concerning them.

33
Clayey and ſandy ſoils.

Beſides the two kinds of ſoils above mentioned, there are others, the principal ingredient of which is clay or ſand. The firſt of theſe is apt to be hardened by the heat of the ſun, ſo that the vegetables can ſcarce penetrate it in ſuch a manner as to receive proper nouriſhment. The ſecond, if it is not ſituated ſo as to receive a great deal of moiſture, is very apt to be parched up in ſummer, and the crop deſtroyed; nor has it ſufficient adheſion to ſupport plants that have few roots and grow high. From theſe oppoſite qualities, it is evident, that theſe two ſoils would be a proper manure for one another; the clay would give a ſufficient degree of firmneſs to the ſand, and the ſand would break the

* See *Water*.

the too great tenacity of the clay. According to Dr Home's experiments, however, ſand is the worſt manure for clay that can be uſed. He recommends marle moſt. To reduce clay-ground as near as poſſible to the form of pure vegetable mould, it muſt firſt be pulverized. This is moſt effectually performed by ploughing and harrowing; but care muſt be taken not to plough it whilſt too wet, otherwiſe it will concrete into hard clots which can ſcarcely be broken. After it is pulverized, however, ſome means muſt be taken to keep it from concreting again into the ſame hard maſſes as before. According to Lord Kames, though clay, after pulverizing, will concrete into as hard a maſs as before, if mixed with water; yet if mixed with dunghill juice, it will not concrete any more. Lime alſo breaks its tenacity, and is very uſeful as a manure for this kind of ſoil.

34
Fertility of the earth limited.

The concluſion we wiſh the practical farmer to draw from our theory is, That there is a certain limit to the fertility of the earth, both as to duration and to degree, at any particular time: that the nearer any ſoil approaches to the nature of pure garden-mould, the nearer it is to the moſt perfect degree of fertility; but that there are no hopes of keeping it perpetually in ſuch a ſtate, or in any degree of approximation to it, but by conſtant and regular manuring with dung. Lime, chalk, marle, &c may be proper to bring it near to this ſtate, but are abſolutely unfit to keep it continually ſo. They may indeed for ſeveral years produce large crops; but the more they increaſe the fertility for ſome years, the ſooner will they bring on an abſolute barrenneſs; while regular manuring with plenty of dung will always enſure the keeping up the ſoil in good condition, without any occaſion for fallow. What we have ſaid concerning the uſe of lime, &c. applies likewiſe to the practice of frequent ploughing, though in a leſs degree. This tends to meliorate ground that is naturally poor, by giving an opportunity to the vegetable parts to putrefy; but when that is done, it tends to exhauſt, though not ſo much as lime. A judicious farmer will conſtantly ſtrive to keep his lands always in good condition, rather than to make them ſuddenly much better; leſt a few years ſhould convince him that he was in reality doing almoſt irreparable miſchief, while he fancied himſelf making improvements. As for the ridiculous notions of ſtimulating the ground by ſaline manures, we hope they will never enter the brain of any rational practitioner of agriculture.

SECT. IV. *Of the different kinds of Vegetables proper to be raiſed with a view to the Melioration of Soil.*

35
Soil pulverized by certain vegetables.

THE methods of meliorating ſoils, which we have mentioned above, conſiſting of tedious and laborious operations that yield no return at firſt, it is natural for a farmer to wiſh for ſome method of meliorating his ground, and reaping crops at the ſame time. One very conſiderable ſtep towards the melioration of ground is, its pulverization. This is accompliſhed by repeated ploughings (A), as already mentioned; eſpecially if performed in autumn, that the ground may be expoſed to the winter's froſt; but theſe ploughings yield no crop as long as the field is not ſown. By planting in the field, however, thoſe vegetables whoſe roots ſwell to a conſiderable bulk, the ground muſt conſtantly be acted upon by the ſwelling of their roots in all directions; and thus the growing of the crop itſelf may be equal, or ſuperior, in efficacy to ſeveral ploughings, at the ſame time that the farmer enjoys the benefit of it. The plant moſt remarkable for the ſwelling of its roots is the potato; and by none is the ground meliorated more, or even ſo much. They are not, however, equally proper for all ſoils. In clay they do not thrive, nor are palatable; but in hard gravelly or ſandy ſoils, they grow to a large ſize, and are of an excellent quality. Turnips likewiſe contribute to meliorate the ground, by the ſwelling of their roots, though not ſo much as potatoes. They have this advantage, however, that they will thrive in almoſt any ſoil. In clay ground, peas and beans thrive exceedingly well, and therefore are proper in this kind of ſoil as a preparatory for other kinds of grain. Theſe puſh their roots deep into the ground, and cover it with their leaves more than other crops; ſo that the ſun has not ſo much acceſs as when it is covered with other kinds of grain. Wherever any of theſe kinds of vegetables are raiſed, it is obſervable, that more or leſs blackneſs is communicated to the ſoil: an evident ſign of its melioration; this being the colour of the true vegetable mould, or *loamy ſoil*, as it is called.

Beſides the above-mentioned plants, carrots, parſnips, cabbages, and all thoſe vegetables which ſink their roots deep in the ground, anſwer the ſame purpoſe of looſening and pulveriſing the earth; but as they will not thrive but on ground already well cultivated, they cannot be raiſed to any advantage for the purpoſe of meliorating a poor ſoil.

It hath been cuſtomary in many places, particularly in England, to ſow turnips, peaſe, buck-wheat, &c. and then to plough them down for manuring the land. This being ſimilar to that operation of nature by which ſhe renders the uncultivated ſoils ſo exceedingly fertile, cannot fail of being attended with ſingular advantages; and might be looked upon as preferable even to driving dung on the land to fatten it, was it not attended with the entire loſs of a crop for that year.

SECT. V. *Of deſtroying Weeds.*

WHAT we have already ſaid regarding the cultivation of the ſoil, reſpects only the fitting it for producing all kinds of vegetables indiſcriminately. Experience, however, ſhows, that the ground is naturally much more diſpoſed to produce and nouriſh ſome kinds of vegetables than others; and thoſe which the earth ſeems moſt to delight in, are commonly ſuch as are of very little uſe to man; but if neglected, will increaſe to ſuch a degree, as entirely to deſtroy the plants intended to be raiſed, or at leaſt hinder them from coming to perfection, by depriving them of nouriſhment. The clearing the ground of weeds, therefore, is an article no leſs neceſſary in agriculture, than the diſpoſing it to produce vegetables of any kind in plenty.

(A) This, however, muſt be underſtood with ſome limitation: for it appears from experience, that many *light* and *thin* ſoils receive detriment rather than advantage from frequent ploughings; particularly in ſummer, when the ſun exhales the nutritive particles in great abundance.

36 Weeds divided into annual and perennial.

The weeds may be divided, according to the time of their duration, into *annual*, or ſuch as ſpring from a ſeed, and die the ſame year; and *perennial*, that is, ſuch as are propagated by the roots, and laſt for a number of years. The firſt kind are the leaſt noxious, and moſt eaſily deſtroyed. For this purpoſe it will be ſufficient to let them ſpring up till near the time of ripening their ſeed, and then plough them down before it comes to maturity. It is alſo of ſervice to deſtroy ſuch weeds as grow in borders, or neglected corners, and frequently ſcatter their ſeeds to a great diſtance; ſuch as the thiſtle, dandelion, rag-weed, &c. for theſe are ſufficient to propagate their ſpecies through a deal of ground; as their ſeeds are carried about with the wind to very conſiderable diſtances. A farmer ought alſo to take care, that the ſmall ſeeds of weeds, ſeparated from corn in winnowing, be not ſown again upon the ground; for this certainly happens when they are thrown upon a dunghill; becauſe, being the natural offspring of the earth, they are not eaſily deſtroyed. The beſt method of preventing any miſchief from this cauſe, would be to burn them.

37 Perennial weeds, how deſtroyed.

Perennial weeds cannot be effectually deſtroyed, but by removing the roots from the ground, which is often a matter of ſome difficulty. Many of theſe roots ſtrike ſo deep in the ground, that they can ſcarcely be got out. The only method that can be depended upon in this caſe, is frequent ploughing, to render the ground as tender as poſſible; and harrowing with a particular kind of harrow, which ſhall hereafter be deſcribed, in order to collect theſe pernicious roots. When collected, they ought to be dried and burnt, as the only effectual method of inſuring their doing no further miſchief.

There is a particular ſpecies of weed, peculiar only to graſs-lands, of a ſoft ſpongy nature, called *fog*, which it is found very difficult to exterminate. Where the land can be conveniently tilled, this weed may be deſtroyed by covering it with a crop of peaſe, potatoes, &c. or paſſing a heavy roller over the ground will be of great ſervice; for fog owes its origin to too great a laxity of the ſoil, and will not grow upon firm ground.

38 Broom, furze, &c. how deſtroyed.

Beſides theſe kinds of weeds which are of an herbaceous nature, there are others which are woody, and grow to a very conſiderable ſize; ſuch as broom, furze or whins, and thorns. *Broom* is an evergreen ſhrub, that thrives beſt in ſandy ſoil; and there it grows ſo vigorouſly, as ſcarce to admit any graſs under it. It propagates by ſeed which grows in pods; and theſe, when fully ripe, break with violence, ſcattering the ſeeds all around. Thus, a field which is overgrown with broom, beſides the old plants, always contains an infinite number of young ones; ſo that though the old plants die when cut over, a freſh crop conſtantly ſprings up. It may, however, be deſtroyed by frequent ploughing and harrowing, in the ſame manner as other perennial weeds are; for it does not for ſome time carry any ſeed, and the frequent ploughing encourages the vegetation of all thoſe that are already in the ground, which cannot fail of being deſtroyed by frequent repetitions of the operation. Another method of deſtroying broom, is by paſturing the field where it grows with ſheep. A few of the old buſhes may be left as a ſhelter, and theſe will be in a good meaſure prevented from ſpreading by the cropping of the ſheep. Theſe animals are very fond of broom, and greedily devour every young ſhoot; ſo that if any remain after the firſt year, there will not be a veſtige the ſecond. If this method of extirpating broom is equally effectual with that of frequent ploughing, it is certainly much more profitable, as there is no food more nouriſhing to ſheep than young broom. Broom, however, is ſaid to have a ſingular effect upon ſheep: it makes them drunk ſo effectually, that when heated with a little driving, they tumble over, and lie without motion.

The *whin* is a fine evergreen ſhrub, carrying a ſweet-ſmelling flower all the year round. It propagates both by ſeed and by its roots, which ſpread ſometimes to the diſtance of 10 or 12 feet; and hence, when once eſtabliſhed, it is with difficulty extirpated. The beſt method is to ſet fire to the whins in froſty weather; for froſt has the effect to wither whins, and make them burn readily. The ſtumps muſt then be cut over with a hatchet; and when the ground is well ſoftened by rain, it may be ploughed up, and the roots taken out by a harrow adapted to that purpoſe. If the field is ſoon laid down to graſs, the whins will again ſpring up in great abundance, from the ſeeds, and ſmall parts of the roots left in the ground. In this caſe, paſturing with ſheep is an effectual remedy; as they are no leſs fond of young whins than of young broom; and if they are a ſufficient number, they will not leave a ſingle plant above ground. But if graſs is not immediately wanted, the moſt effectual method of clearing a field of whins, is by reiterated ploughings.

The *thorn*, or *bramble*, ſpreads its roots very wide, and at the ſame time ſinks them deep in the earth. Though cut in the winter, it riſes, and comes to ſuch perfection as to carry fruit in ſummer. It can only be extirpated by ploughing up the ground, and collecting the roots.

SECT. VI. *Of the moſt proper kinds of Vegetables to be raiſed for the purpoſes of feeding Cattle.*

39 Qualities of the food requiſite for cattle.

THOUGH this muſt be an article of the utmoſt conſequence to every farmer, we do not find that it has been much conſidered. Mr Anderſon ſeems to have been the firſt writer on agriculture who hath properly attended to this ſubject; and what he hath wrote upon it, is rather a catalogue of deſiderata, than any thing elſe: and indeed the deſiderata on this ſubject are ſo many and ſo great, that we muſt acknowledge ourſelves very unable to fill them up.——To attain to a competent knowledge in this reſpect, the following things muſt be taken into conſideration. (1.) The wholeſomeneſs of the food for cattle, with regard to health and ſtrength, or fatneſs. (2.) The quantity that any extent of ground is capable of yielding. (3.) The quantity neceſſary to feed the different kinds of cattle. (4.) The labour of cultivation; and, (5.) The ſoil they require to bring them to perfection, and the effect they have upon it.

With regard to the wholeſomeneſs, it is plain, that as the natural food of wild cattle is the green ſucculent plants they meet with all the year round, food of this kind, could it be had, muſt be preferable to hay; and accordingly we find that cattle will always prefer ſucculent vegetables where they can get them. To find

plants

40 Cabbages, their properties.

plants of this kind, and having proper qualities in other reſpects, we muſt ſearch among thoſe which continue green all the year round, or come to their greateſt perfection in the winter-time.—Of theſe, cabbages bid fair for holding the firſt place; both as being very ſucculent, and a very large quantity of them growing upon a ſmall ſpace of ground. In Mr Young's Six Months Tour, we have an account of the produce of cabbages in many different places, and on a variety of ſoils. The produce by Mr Crow at Keplin, on a clay ſoil, was, on an average of ſix years, 35 tons per acre; by Mr Smelt at the Leaſes, on a ſandy gravel, 38 tons per acre; by Mr Scroop at Danby, on an average of ſix years, 37 tons per acre: and the general average of all the accounts given by Mr Young, is 36 tons per acre.

41 Air rendered noxious by them.

Cabbages, however, have the great inconveniency of ſometimes imparting a diſagreeable flavour to the milk of cows fed with them, and even to the fleſh of other cattle. This, it is ſaid, may be prevented by carefully picking off the decayed and withered leaves: and very probably this is the caſe; for no vegetable inclines more to putrefaction than this; and therefore particular care ought to be taken to pull off all the leaves that have any ſymptoms of decay. Dr Prieſtley found that air was rendered noxious by a cabbage-leaf remaining in it for one night, though the leaf did not ſhow any ſymptom of putrefaction.—For milk-cows, probably the cabbages might be rendered more proper food by boiling them.

42 Turnip-rooted cabbage.

The culture of the turnip-rooted cabbage has lately been much practiſed, and greatly recommended, particularly for the purpoſe of a late ſpring feed; and ſeems indeed to be a more important article in the farming œconomy, as will be ſhown in its proper place.

43 Turnips.

Turnips likewiſe produce very bulky crops, though far inferior to thoſe of cabbages. According to Mr Young's calculation, the fineſt ſoil does not produce above five tons of turnips per acre; which is indeed a very great diſproportion: but poſſibly ſuch a quantity of turnips may not be conſumed by cattle as of cabbages; an ox, of 80 ſtone weight, eat 210 ℔. of cabbages in 24 hours, beſides ſeven pound of hay.

44 Carrots.

Carrots are found to be an excellent food for cattle of all kinds, and are greatly reliſhed by them. In a rich ſand, according to Mr Young's account, the produce of this root was 200 buſhels per acre. In a finer ſoil, it was 640 buſhels per acre. A lean hog was fatted by carrots in ten days time: he eat 196 ℔.; and his fat was very fine, white, firm, and did not boil away in the dreſſing. They were preferred to turnips by the cattle; which having taſted the carrots, ſoon became ſo fond of them, as difficultly to be made to eat the turnips at all. It is probable, indeed, that carrots will make a more wholeſome food for cattle than either cabbages or turnips, as they are ſtrongly antiſeptic; inſomuch as to be uſed in poultices for correcting the ſanies of cancers. It is probably owing to this, that the milk of cows fed on carrots is never found to have any bad taſte. Six horſes kept on them thro' the winter without oats, performed their work as uſual, and looked equally well. This may be looked upon as a proof of their ſalubrity as a food; and it certainly can be no detriment to a farmer to be ſo much verſant in medical matters, as to know the impropriety of giving putreſcent food to his cattle. It is well known, what a prodigious difference there is in the health of the human ſpecies when fed on putrid meats, in compariſon of what they enjoy when ſupplied with food of a contrary nature; and why may there not be a difference in the health of beaſts, as well as of men, when in ſimilar circumſtances?—It is alſo very probable, that as carrots are more ſolid than cabbages or turnips, they will go much farther in feeding cattle than either of them. The above-mentioned example of the hog ſeems ſome kind of confirmation of this; he being fed, for ten days together, with 21 ℔. leſs weight of carrots than what an ox devoured of cabbages and hay in one day. There is a great diſproportion, it muſt be owned, between the bulk of an ox and that of a hog; but we can ſcarce think that an ox will eat as much at a time as ten hogs. At Parlington in Yorkſhire, 20 work-horſes, four bullocks, and ſix milk-cows, were fed on the carrots that grew on three acres, from the end of September till the beginning of May; and the animals never taſted any other food but a little hay. The milk was excellent, and 30 hogs were fatted upon what was left by the other cattle.

45 Potatoes.

Potatoes likewiſe appear to be a very palatable food for all kinds of cattle; and not only oxen, hogs, &c. are eaſily fed by them, but even poultry. The cheapneſs of potates compared with other kinds of food for cattle, cannot well be known, as, beſides the advantage of the crop, they improve the ground more than any other known vegetable. According to a correſpondent of the Bath Society *, " roaſting pork is never ſo moiſt and delicate as when fed with potatoes, and killed from the barn-door, without any confinement. For bacon and hams, two buſhels of pea-meal ſhould be well incorporated with four buſhels of boiled potatoes, which quantity will fat a hog of twelve ſtone (fourteen pounds to the ſtone). Cows are particularly fond of them: half a buſhel at night, and the ſame proportion in the morning, with a ſmall quantity of hay, is ſufficient to keep three cows in full milk; they will yield as much and as ſweet butter as the beſt graſs. In fattening cattle, I allow them all they will eat: a beaſt of about 35 ſtone will require a buſhel per day, but will fatten one-third ſooner than on turnips. The potatoes ſhould be clean waſhed, and not given until they are dry. They do not require boiling for any purpoſe but fattening hogs for bacon, or poultry; the latter eat them greedily. I prefer the champion potato to any ſort I ever cultivated. They do not anſwer ſo well for horſes and colts as I expected (at leaſt they have not with me), though ſome other gentlemen have approved of them as ſubſtitutes for oats."

The above-mentioned vegetables have all of them the property of meliorating, rather than exhauſting the ſoil; and this is certainly a very valuable qualification: but carrots and cabbages will not thrive except in ſoils that are already well cultivated; while potatoes and turnips may be uſed as the firſt crops of a ſoil with great advantage. In this reſpect they are greatly ſuperior to the others; as it may be diſagreeable to take up the beſt grounds of a farm with plants deſigned only for food to cattle.

46 Buck-wheat.

Buck-wheat *(Polygonum fagopyrum)* has been lately recommended as an uſeful article in the preſent as well as other reſpects. It has been cheifly applied to the feeding of hogs, and eſteemed equal in value to barley; it is much more eaſily ground than barley, as a malt-mill will grind it completely. Horſes are very fond of the grain; poultry of all ſorts are ſpeedily fattened by it; and the bloſſom of the plant affords food for bees at a very opportune ſeaſon of the year, when the meadows and trees are moſtly ſtripped of their flowers. Probably the grain may hereafter be even found a material article in diſtillation, ſhould a ſufficient quantity be raiſed with that view. From the ſucceſs of ſome experiments detailed in the Bath Society Papers, and for which a premium was beſtowed, it has been inferred, that this article ought in numerous caſes to ſuperſede the practice of ſummer-fallowing.

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* *Letters and Papers on Agriculture,* &c. vol. iii. art. 16.

47 Whins an excellent food for horſes. Whins have lately been recommended as a very proper food for cattle, eſpecially horſes; and are recommended by Mr Anderſon in a particular manner. They have this advantage, that they require no culture, and grow on the very worſt ſoil; but they are troubleſome to cut, and require to be bruiſed in a mill conſtructed for this purpoſe; neither is the ground at all meliorated by letting whins grow upon it for any length of time. Notwithſtanding theſe diſadvantages, however, as whins continue green all the year round, and when bruiſed will afford an excellent ſucculent food, which ſeems poſſeſſed of ſtrongly invigorating qualities, they may be looked upon as the cheapeſt winter-food that can poſſibly be given to cattle.—According to the calculations of Mr Eddiſon of Gateford, a ſingle acre, well cropped with whins, will winter ſix horſes: at three or four years growth, the whole crop ſhould be taken, cut cloſe to the ground, and carried to the mill; in which the whins are to be bruiſed, and then given to the horſes. Four acres ought to be planted, that one may be uſed each year, at the proper age to be cut; and he reckons the labour of one man ſufficient for providing food to this number of horſes. He ſays they all prefer the whins to hay, or even to corn.

48 Burnet. The herb called *burnet* hath likewiſe been recommended as proper food for cattle, on account of its being an evergreen; and further recommended, by growing almoſt as faſt in winter as in ſummer. Of this herb, however, we have very various accounts. In a letter addreſſed by Sir James Caldwell, F. R. S. to the Dublin Society, the culture of this plant is ſtrongly recommended on the authority of one Bartholomew Rocque, farmer at Walham-Green, a village about three miles ſouth-weſt of London.

49 Recommended by Sir James Caldwell. What gave occaſion to the recommendation of this plant, was, that about the year 1760, Mr Wych, chairman of the committee of Agriculture of the London Society for the encouragement of arts, manufactures, and commerce, came to Rocque (who was become very eminent by the premiums he had received from the ſociety), and told him, he had been thinking, that as there are many animals which ſubſiſt wholly upon the fruits of the earth, there muſt certainly be ſome plant or herb fit for them that naturally vegetates in winter; otherwiſe we muſt believe the Creator, infinitely wiſe and good, to have made creatures without providing for their ſubſiſtence; and that if there had been no ſuch plants or herbs, many ſpecies of animals would have periſhed before we took them out of the hands of nature, and provided for them dry meat at a ſeaſon, when, indigenous plants having been indiſcriminately excluded, under the name of weeds, from cultivated fields and places ſet apart for natural graſs, green or freſh meat was no longer to be found.

Rocque allowed the force of this reaſoning; but ſaid, the knowledge of a graſs, or artificial paſture, that would vegetate in winter, and produce green fodder for cattle, was loſt; at leaſt, that he knew of no ſuch plant.—Mr Wych, however, knowing how very great the advantage would be of diſcovering a green fodder for winter and early in the ſpring, wrote to Berne, and alſo to ſome conſiderable places in Sweden, ſtating the ſame argument, and aſking the ſame queſtion. His anſwers to theſe letters were the ſame that had been given by Rocque. They owned there muſt be ſuch a plant, but declared they did not know it.

Mr Wych then applied again to Rocque; and deſired him to ſearch for the plant ſo much deſired, and ſo certainly exiſting. Rocque ſet about this ſearch with great aſſiduity; and finding that a pimpernel, called *burnet*, was of very ſpeedy growth, and grew near as faſt in winter as in ſummer, he took a handful of it and carried it into his ſtable, where there were five horſes; every one of which eat it with the greateſt eagerneſs, ſnatching it even without firſt ſmelling it. Upon the ſucceſs of this experiment he went to London, and bought all the burnet-ſeed he could get, amounting to no more than eight pounds, it having been only uſed in ſalads; and he paid for it at the rate of 4s. a pound. Six of the eight pounds of ſeed he ſowed upon half an acre of ground, in March, in the year 1761, with a quarter of a peck of ſpring-wheat, both by hand. The ſeed being very bad, it came up but thin. However, he ſowed the other two pounds in the beginning of June, upon about ſix rood of ground: this he mowed in the beginning of Auguſt; and at Michaelmas he planted off the plants on about 20 rood of ground, giving each plant a foot every way, and taking care not to bury the heart. Theſe plants bore two crops of ſeed the year following; the firſt about the middle of June, the ſecond about the middle of September; but the June crop was the beſt. The year after, it grew very rank, and produced two crops of ſeed, both very good. As it ought not to be cut after September, he let it ſtand till the next year; when it ſheltered itſelf, and grew very well during all the winter, except when there was a hard froſt; and even during the froſt it continued green, though it was not perceived to grow. In the March following it covered the ground very well, and was fit to receive cattle.

If the winter is not remarkably ſevere, the burnet, though cut in September, will be 18 inches long in March; and it may be fed from the beginning of February till May: if the cattle are taken off in May, there will be a good crop of ſeed in the beginning of July. Five weeks after the cattle are taken off, it may be removed, if that is preferred to its ſtanding for ſeed; it grows at the rate of an inch a-day, and is made into hay like other graſs. It may be mown three times in one ſummer, and ſhould be cut juſt before it begins to flower. Six rood of ground has produced 1150 pounds at the firſt cutting of the third year after it was ſowed; and, in autumn 1763, Rocque ſold no leſs than 300 buſhels of the ſeed.

According to Rocque, the ſoil in which burnet flouriſhes beſt, is a dry gravel; the longeſt drought never hurts it : and Sir James Caldwell aſſerts, that he ſaw a very vigorous and exuberant plant of this kind, growing from between two bricks in a wall in Rocque's ground, without any communication with the ſoil ; for he had cut away all the fibres of the root that had ſtretched downward, and penetrated the earth, long before.

Burnet was found equally fit for feeding cows, ſheep, and horſes ; but the ſheep muſt not be ſuffered to crop it too cloſe. Though no ſeed was left among the hay, yet it proved nouriſhing food ; and Rocque kept a horſe upon nothing elſe, who, at the time of writing the account, was in good heart, and looked well. He affirmed alſo, that it cured horſes of the diſtemper called the *greaſe*, and that by its means he cured one which was thought incurable ; but ſays, it is only the firſt crop which has this effect.

50
Burnet reckoned an improper food by Mr Miller and Mr Anderſon.

This is the ſubſtance of Sir James Caldwell's letter to the Dublin Society, at leaſt as to what regards the culture of burnet ; and it might reaſonably be expected, that a plant, whoſe uſe was recommended to the public with ſo much parade, would ſoon have come into univerſal eſteem. We were ſurpriſed, therefore, on looking into Mr Miller's Dictionary, to find the following words, under the article *Poterium* :—“ This plant has of late been recommended by *perſons of little ſkill*, to be ſown as a winter pabulum for cattle : but whoever will give themſelves the trouble to examine the grounds where it naturally grows, will find the plants left uneaten by the cattle, when the graſs about them has been cropped to the roots ; beſides, in wet winters, and in ſtrong land, the plants are of ſhort duration, and therefore very unfit for that purpoſe : nor is the produce ſufficient to tempt any perſon of ſkill to engage in its culture ; therefore I wiſh thoſe perſons to make trial of it in ſmall quantities, before they embark largely in theſe new ſchemes.”—Mr Anderſon, too, in his Eſſays on Agriculture, mentions the produce of burnet being ſo ſmall, as not to be worth cultivating.

51
White beet recommended.

Upon the authority of Mr Rocque, likewiſe, the white beet is recommended as a moſt excellent food for cows ; that it vegetates during the whole winter, conſequently is very forward in the ſpring ; and that the moſt profitable way of feeding cows, is, to mow this herb, and give it to them green all the ſummer. It grew in Rocque's garden, during a very great drought, no leſs than four feet high, from the 30th of May to the 3d of July : which is no more than one month and four days. In ſummer it grows more than an inch a-day, and is beſt ſown in March : a buſhel is enough for an acre, and will not coſt more than ten ſhillings. It thrives beſt in a rich, deep, light ſoil : the ſtalks are very thick and ſucculent ; the cows ſhould therefore eat them green.

52
Root of Scarcity.

Another ſpecies of beet (*Beta cicla*), the Mangel Wurzel, or *Root of Scarcity*, as it has been called, has been lately extolled as food both for man and cattle ; but, after all, ſeems only to deſerve attention in the latter view. It is a biennial plant ; the root is large and fleſhy, ſometimes a foot in diameter. It riſes above the ground ſeveral inches, is thickeſt at the top, tapering gradually downward. The roots are of various colours, white, yellow, and red ; but theſe laſt are always of a much paler colour than beetrave. It is good fodder for cows, and does not communicate any taſte to the milk. It produces great abundance of leaves in ſummer, which may be cut three or four times without injuring the plant. The leaves are more palatable to cattle than moſt other garden plants, and are found to be very wholeſome. The farmers in thoſe parts of Germany where it is chiefly cultivated, we are told, prefer this ſpecies of beet, for feeding cattle, to cabbages, principally becauſe they are not ſo liable to be hurt by worms or inſects ; but they think they are not ſo nouriſhing as turnips, potatoes, or carrots, and that cattle are not nearly ſo ſoon fattened by this root as by carrots, parſnips, or cabbages. It has even been aſſerted, that this root affords leſs nouriſhment than any of thoſe that have been commonly employed for feeding cattle. This does not correſpond with the pompous accounts with which the public has been entertained. Upon the whole, however, it is a plant which ſeems to deſerve the attention of farmers ; as on ſome ſoils, and in particular circumſtances, it may prove a very uſeful article for the above purpoſes.

53
Sheep's feſcue-graſs.

In Mr Anderſon's eſſays, we find it recommended to make trial of ſome kinds of graſſes, which probably would not only anſwer for freſh fodder during the winter, but might alſo be cut for hay in ſummer. This is particularly the caſe with that ſpecies called *ſheep's feſcue-graſs*. “ I had (ſays he) a ſmall patch of this graſs in winter 1773 ; which, having been cut in the month of Auguſt or September preceding, was ſaved from that period, and had advanced before winter to the length of five or ſix inches ; forming the cloſeſt pile that could be imagined. And although we had about ſix weeks of very intenſe froſt, with ſnow ; and about other ſix weeks, immediately ſucceeding that, of exceeding keen froſt every night, with frequent thaws in the day-time, without any ſnow, during which time almoſt every green thing was deſtroyed ; yet this little patch continued all along to retain as fine a verdure as any meadow in the month of May ; hardly a point of a leaf having been withered by the uncommon ſeverity of the weather. And as this graſs begins to vegetate very early in the ſpring, I leave the reader to judge what might be the value of a field of graſs of this kind in theſe circumſtances.”

54
Purple feſcue.

Of another kind of graſs, called *purple feſcue*, Mr Anderſon gives the following character. “ It retained its verdure much better than rye-graſs during the winter-ſeaſon ; but it had more of its points killed by the weather than the former. It likewiſe riſes in the ſpring at leaſt as early as rye-graſs.

This ingenious farmer has alſo made experiments on the culture of theſe and ſeveral other kinds of graſſes ; which, being very well worthy of attention, we ſhall here inſert.

1. *Purple feſcue-graſs*. “ Although this graſs is very often found in old paſtures, yet as it has but few flower-ſtalks, and as it is greedily eat by all domeſtic animals, theſe are ſeldom ſuffered to appear ; ſo that it uſually remains there unperceived. But it ſeems to be better able to endure the peculiar acrimony of the dung of dogs than almoſt any other plant ; and is therefore often to be met with in *dog-hills*, as I call the little hills by road ſides where dogs uſually piſs and dung : and as it is allowed to grow there undiſturbed, the farmer may have an opportunity of examining the plant, and becoming acquainted with its appearance.

“ The leaves are long and ſmall, and appear to be roundiſh, ſomewhat like a wire; but, upon examination, they are found not to be tubulated like a reed or ruſh; the ſides of the leaf being only folded together from the middle rib, exactly like the ſtrong bent-graſs on the ſea-ſhore. The flower-ſtalk is ſmall, and branches out in the head, a little reſembling the wild-oat; only the grains are much ſmaller, and the ear does not ſpread full open, but lies bending a little to one ſide. The ſtalks are often ſpotted with reddiſh freckles, and the tops of the roots are uſually tinged with the ſame colour; from whence it has probably obtained its diſtinctive name of *Feſtuca rubra*, or *red (purple) feſcue*.

“ It is often to be met with in old garden-walks; and, as its leaves advance very quickly after cutting, it may uſually be diſcovered above the other graſſes, about a week or fortnight after the walks are cut. Nor do they ſeem to advance only at one ſeaſon, and then ſtop and decay, like the rye-graſs; but continue to advance during the whole of the ſummer, even where they are not cut; ſo that they ſometimes attain a very great length. Laſt ſeaſon, (1774,) I meaſured a leaf of this graſs, that ſprung up in a neglected corner, which was four feet and four inches in length, although not thicker than a ſmall wire. It is unneceſſary to add, that theſe leaves naturally trail upon the ground, unleſs where they meet with ſome accidental ſupport; and that if any quantity of it is ſuffered to grow for a whole ſeaſon, without being eat down or cut, the roots of the leaves are almoſt rotted, by the overſhadowing of the tops of the other leaves, before the end of the ſeaſon.

55 Appearance in its cultivated ſtate.

“ This is the appearance and condition of the plant in its native ſituation: as it is ſeldom that it is diſcovered but in pretty old paſtures, and as in that ſtate it carries only a very few ſeed-ſtalks, it was with ſome difficulty that I could collect a ſmall handful of the ſeed, which I carefully ſowed in a ſmall patch of garden-mould, to try if it could be eaſily cultivated. It came up as quickly as any other kind of graſs, but was at firſt as ſmall as hairs: the leaves, however, advanced apace; and were, before autumn, when the grain with which they had been ſowed was cut down, about 16 or 18 inches in length: but having been ſown very thin, it was neceſſary to pick out ſome other kinds of graſs that came up amongſt it, leſt it might have been choaked by them. Early next ſpring it advanced with prodigious vigour, and the tufts that were formed from every ſeed became exceeding large; ſo that it quickly filled the whole ground. But now the leaves were almoſt as broad as thoſe of common rye-graſs, and the two ſides only inclined a little towards one another from the mid-rib, without any appearance of roundneſs. In due time a great many ſeed-ſtalks ſprung out, which attained very nearly to the height of four feet, and produced ſeeds in abundance; which may be as eaſily ſaved as thoſe of common rye-graſs.

“ The prodigious difference between this plant in its native and cultivated ſtate amazed me; but it was with a good deal of ſatisfaction that I found there would be no difficulty of procuring ſeeds from it, which I had much doubted of at firſt. It would ſeem, that nature hath endowed this plant with a ſtrong generative power during its youth, which it gradually loſes as it advances in age (for the difference perceived in this caſe could not be attributed to the richneſs of the ſoil): and that, on the contrary, when it was old, the leaves advanced with an additional vigour, in proportion to the declining ſtrength of the flower-ſtalks: for the leaves of the young plant ſeldom exceed two feet, whereas numbers of the old leaves were near four feet in length.

“ From theſe peculiarities in the growth of this plant, it would ſeem to promiſe to be of great uſe to the farmer; as he could reap from a field of it, for the firſt two or three years, as great a weight of hay as he could obtain from any of the culmiferous graſſes (theſe bearing a long jointed ſtalk); and, if he meant afterwards to paſture it, he would ſuffer no inconveniences from the flower-ſtalks; and the ſucculent leaves that continue to vegetate during the whole ſummer, would at all times furniſh his cattle with abundance of wholeſome food. It has alſo been remarked, that this graſs riſes as early in the ſpring as rye graſs; and continues green for the greateſt part of winter, which the other does not. It is moreover an abiding plant, as it ſeems never to wear out of the ground where it has once been eſtabliſhed. On all which accounts, it appears to me highly to merit the attention of the farmer; and well deſerves to have its ſeveral qualities, and the culture that beſt agrees with it, aſcertained by accurate experiments.

56 Sheep's feſcue deſcribed.

2. “ *Sheep's feſcue graſs*, or *feſtuca ovina*, is much praiſed by the Swediſh naturaliſts for its ſingular value as a paſture-graſs for ſheep; this animal being repreſented as fonder of it than of any other graſs, and fattening upon it more quickly than on any other kind of food whatever. And indeed, the general appearance of the plant, and its peculiar manner of growth, ſeems very much to favour the accounts that have been given us of it.

“ This plant is of the ſame family with the former, and agrees with it in ſeveral reſpects; although they may be eaſily diſtinguiſhed from one another. Its leaves, like the former, in its natural ſtate, are always rounded, but much ſmaller; being little bigger than large horſe-hairs, or ſwine-briſtles, and ſeldom exceed ſix or ſeven inches in length. But theſe ſpring out of the root in tufts, ſo cloſe upon one another, that they reſemble, in this reſpect, a cloſe hair-bruſh more than any thing elſe I know: ſo that it would ſeem naturally adapted to form that thick ſhort pile of graſs in which ſheep are known chiefly to delight. Its flower-ſtalks are numerous, and ſometimes attain the height of two feet: but are more uſually about 12 or 15 inches high.

57 Its appearance when cultivated.

“ Upon gathering the ſeeds of this plant, and ſowing them as the former, it was found that they ſprung up as quickly as any other kind of graſs; but the leaves are at firſt no bigger than a human hair. From each ſide ſprings up one or two of theſe hair-like filaments, that in a ſhort time ſend out new off-ſets, ſo as quickly to form a ſort of tuft, which grows larger and larger, till it at length attains a very large ſize, or till all the intervals are cloſed up, and then it forms the cloſeſt pile of graſs that it is poſſible to imagine. In April and May it puſhed forth an innumerable quantity of flower-ſtalks, that afforded an immenſe quantity of hay; it being ſo cloſe throughout, that the ſcythe could ſcarcely penetrate it. This was allowed to ſtand till the ſeeds ripened; but the bottom of the ſtalks were quite blanched, and almoſt rotted for want of air before that time.

“ This was the appearance that it made the firſt year after it was ſowed: but I have reaſon to think, that, after a few years, it likewiſe produces fewer ſeed-ſtalks, and a greater quantity of leaves than at firſt. But however that may be, it is certain, that if theſe are eat down in the ſpring, it does not, like rye-graſs, perſiſt in a continued tendency to run to ſeed; but is at once determined to puſh forth a quantity of leaves without almoſt any ſtalks at all: and as all domeſtic animals, but more eſpecially ſheep, are extremely fond of this graſs, if they have liberty to paſture where it grows, they bite it ſo cloſe as never to ſuffer almoſt a ſingle ſeed-ſtalk to eſcape them; ſo that the botaniſt will often ſearch in vain for it, when he is treading upon it with his feet. The beſt way to diſcover it in any paſture, is to ſearch for it in the winter, when the tufts of it may be eaſily diſtinguiſhed from every other kind of graſs, by their extraordinary cloſeneſs, and the deep green colour of the leaves.

58 What ſoil moſt proper.

“ It ſeems to grow in almoſt any ſoil; altho' it is imagined that it would flouriſh beſt in a light ſandy ſoil, as it can evidently live with leſs moiſture than almoſt any other kind of graſs; being often ſeen to remain in the ſods that have been employed in coping for ſtone-dykes, after all the other graſſes that grew in them have diſappeared. It is likewiſe found in poor barren ſoils, where hardly any other plant can be made to grow at all; and on the ſurface of dry worn-out peat-moſs, where no moiſture remains ſufficient to ſupport any other plant whatever: but in neither of theſe ſituations does it thrive; as it is there only a weak and unſightly plant, very unlike what it is when it has the good fortune to be eſtabliſhed upon a good ſoil; although it is ſeldomer met with in this laſt ſtate than in the former.

“ I will not here repeat what has been already ſaid about the particular property that this plant poſſeſſes of continuing all winter; nor point out the benefits that the farmer may reap from this valuable quality.—He need not, however, expect to find any verdure in winter on ſuch plants as grow upon the looſe moſſy ſoil above-mentioned; for as the froſt in winter always hoves up the ſurface of this ſoil, the roots of the plants are ſo lacerated thereby, as to make it, for ſome time in the ſpring, to all appearance dead. Nor will he often perceive much verdure in winter upon thoſe plants that grow upon poor hungry ſoils, which cannot afford abundant nouriſhment to keep them in a proper ſtate of vegetation at all times: but ſuch plants as grow on earthen dykes, which uſually begin to vegetate with vigour when the autumnal rains come on, for the moſt part retain their verdure at that ſeaſon almoſt as well as if they were in good garden-mould.

“ I have been very particular in regard to this plant; becauſe, in as far as my obſervations have yet gone, it promiſes on many accounts to make a moſt valuable acquiſition to the farmer, and therefore juſtly demands a very particular ſhare of his attention.”

59 Holcus lanatus.

3. The *holcus lanatus*, or creeping ſoft-graſs of Hudſon.—This is conſidered by our author as one of the moſt valuable kinds of meadow-graſſes; its pile being exceedingly cloſe, ſoft, and ſucculent. It delights much in moiſture, and is ſeldom found on dry ground, unleſs the ſoil is exceeding rich. It is often found on thoſe patches near ſprings, over which the water frequently flows; and may be known by the uncommon ſoftneſs and ſucculence of the blade, the lively light green colour of the leaves and the matted intertexture of its roots. But, notwithſtanding the ſoftneſs of its firſt leaves, when the ſeed-ſtalks advance, they are rough to the touch, ſo that the plant then aſſumes a very different appearance from what we would have expected. The ear is branched out into a great number of fine ramifications ſomewhat like the oat, but much ſmaller.—This kind of graſs, however, would not be eaſily cultivated, on account of a kind of ſoft membrane that makes the ſeeds adhere to the ſtalk, and to one another after they are ſeparated from it, as if they were intermixed with cobweb, ſo that it is difficult to get them ſeparated from the ſtalk, or to ſpread readily in ſowing. It ſpreads, however, ſo faſt by its running roots, that a ſmall quantity ſowed very thin, would be ſufficient to ſtock a large field in a ſhort time.

Theſe are the kinds of *graſſes*, properly ſo called, which have not as yet been cultivated, that Mr Anderſon thinks the moſt likely to be of value; but, beſides theſe, he recommends the following, of the pea-tribe.

60 Milk-vetch.

1. *Milk-vetch, liquorice-vetch,* or *milkwort.* This plant, in ſome reſpects, very much reſembles the common white clover; from the top of the root a great number of ſhoots come out in the ſpring, ſpreading along the ſurface of the ground every way around it; from which ariſe a great many cluſters of bright yellow flowers, exactly reſembling thoſe of the common broom. Theſe are ſucceeded by hard round pods, filled with ſmall kidney-ſhaped ſeeds. From a ſuppoſed reſemblance of a cluſter of theſe pods to the fingers of an open hand, the plant has been ſometimes called *ladies-fingers.* By others it is called *crow-toes,* from a fancied reſemblance of the pods to the toes of a bird. Others, from the appearance of the bloſſom, and the part where the plant is found, have called it *feal,* improperly *fell-broom.* It is found plentifully almoſt every where in old graſs-fields; but as every ſpecies of domeſtic animals eat it, almoſt in preference to any other plant, it is ſeldom allowed to come to the flower in paſture-grounds, unleſs where they have been accidentally ſaved from the cattle for ſome time; ſo that it is only about the borders of corn-fields, or the ſides of incloſures to which cattle have not acceſs, that we have an opportunity of obſerving it. As it has been imagined that the cows which feed on theſe paſtures, where this plant abounds, yield a quantity of rich milk, the plant has, from that circumſtance, obtained its moſt proper Engliſh name of *milk-vetch.*

61 Its good qualities.

One of the greateſt recommendations of this plant is, that it grows in poor barren ground, where almoſt no other plant can live. It has been obſerved in ground ſo poor, that even heath, or ling (*erica communis*), would ſcarcely grow; and upon bare obdurate clays, where no other plant could be made to vegetate; inſomuch that the ſurface remained entirely uncovered, unleſs where a plant of this kind chanced to be eſtabliſhed; yet even in theſe unfavourable circumſtances, it flouriſhed with an uncommon degree of luxuriance, and yielded as tender and ſucculent, though not ſuch abundant ſhoots, as if reared in the richeſt manured fields. In dry barren ſands, alſo, where almoſt no other plant could be made to live, it has been found to ſend out ſuch a number of healthy ſhoots all around, as to cover the earth with the cloſeſt and moſt beautiful carpet that can be deſired.

The ſtalks of the milk-vetch are weak and ſlender, ſo that they ſpread upon the ſurface of the ground, unleſs they are ſupported by ſome other vegetable. In ordinary ſoils they do not grow to a great length, nor produce many flowers; but in richer fields the ſtalks grow to a much greater length, branch out a good deal, but carry few or no flowers or ſeeds. From theſe qualities our author did not attempt at firſt to cultivate it with any other view than that of paſture; and, with this intention, ſowed it with his ordinary hay-ſeeds, expecting no material benefit from it till he deſiſted from cutting his field. In this, however, he was agreeably diſappointed; the milk-vetch growing, the firſt ſeaſon, as tall as his great clover, and forming exceeding fine hay; being ſcarce diſtinguiſhable from lucerne, but by the ſlenderneſs of the ſtalk, and proportional ſmallneſs of the leaf.

Another recommendation to this plant is, that it is perennial. It is ſeveral years after it is ſowed before it attains to its full perfection; but, when once eſtabliſhed, it probably remains for a great number of years in full vigour, and produces annually a great quantity of fodder. In autumn 1773, Mr Anderſon cut the ſtalk from an old plant that grew on a very indifferent ſoil; and after having thoroughly dried it, he found that it weighed 14 ounces and a half.

The ſtalks of this plant die down entirely in winter, and do not come up in the ſpring till the ſame time that clover begins to advance; nor does it advance very faſt, even in the ſummer, when once cut down or eat over: ſo that it ſeems much inferior to the abovementioned graſſes; but might be of uſe to cover the worſt parts of a farm, on which no other vegetable could thrive.

62 Yellow vetchling.

2. The *common yellow vetchling*, (*Lathyrus pratenſis*) or *everlaſting tare*, grows with great luxuriance in ſtiff clay ſoils, and continues to yield annually a great weight of fodder, of the very beſt quality, for any length of time. This is equally fit for paſture, or hay; and grows with equal vigour in the end of ſummer as in the beginning of it; ſo would admit being paſtured upon in the ſpring, till the middle, or even the end of May, without endangering the loſs of the crop of hay. This is an advantage which no other plant except clover poſſeſſes; but clover is equally unfit for early paſture or for hay. Sain-foin is the only plant whoſe qualities approach to it in this reſpect, and the yellow vetchling will grow in ſuch ſoils as are utterly unfit for producing ſain-foin.—It is alſo a perennial plant, and encreaſes ſo faſt by its running roots, that a ſmall quantity of the ſeed would produce a ſufficient number of plants to fill a whole field in a very ſhort time. If a ſmall patch of good ground is ſowed with the ſeeds of this plant in rows, about a foot diſtance from one another, and the intervals kept clear of weeds for that ſeaſon, the roots will ſpread ſo much as to fill up the whole patch next year; when the ſtalks may be cut for green fodder or hay. And if that patch were dug over in the ſpring following, and the roots taken out, it would furniſh a great quantity of plants, which might be planted at two or three feet diſtance from one another, where they would probably overſpread the whole field in a ſhort time.

63 Blue tare.

3. The *common blue tare* ſeems more likely than the former to produce a more nouriſhing kind of hay, as it abounds much more in ſeeds; but as the ſtalks come up more thinly from the root, and branch more above, it does not appear to be ſo well adapted for a paſture-graſs as the other. The leaves of this plant are much ſmaller, and more divided, than thoſe of the other; the ſtalks are likewiſe ſmaller, and grow to a much greater length. Though it produces a great quantity of ſeeds, yet the ſmall birds are ſo fond of them, that, unleſs the field was carefully guarded, few of them would be allowed to ripen.

64 Buſh-vetch

4. The *Vicia ſepium, purple everlaſting*, or *buſh-vetch*. Our author gives the preference to this plant beyond all others of the ſame tribe for paſture. the roots of it ſpread on every ſide a little below the ſurface of the ground, from which, in the ſpring, many ſtems ariſe quite cloſe by one another; and as theſe have a broad tufted top covered with many leaves, it forms as cloſe a pile as could be deſired. It grows very quickly after being cut or cropt, but does not arrive at any great height; ſo that it appears more proper for paſturage than making hay; altho', upon a good ſoil, it will grow ſufficiently high for that purpoſe; but the ſtalks grow ſo cloſe upon one another, that there is great danger of having it rotted at the root, if the ſeaſon ſhould prove damp. It ſeems to thrive beſt in a clay ſoil.

65 Everlaſting pea.

Beſides theſe, there are a variety of others of the ſame claſs, which he thinks might be uſeful to the farmer. The common garden everlaſting pea, cultivated as a flowering plant, he conjectures, would yield a prodigious weight of hay upon an acre; as it grows to the height of ten or twelve feet, having very ſtrong ſtalks, that could ſupport themſelves without rotting till they attained a great height.

66 Achillæa millefolium.

One other plant, hitherto unnoticed, is recommended by our author to the attention of the farmer; it is the *common yarrow*, (*Achillea millefolium*), or *hundred-leaved graſs*. Concerning this plant, he remarks, that, in almoſt every fine old paſture, a great proportion of the growing vegetables with which the field is covered, conſiſts of it; but the animals which feed there are ſo fond of the yarrow, as never to allow one ſeed-ſtalk of it to come to perfection. Hence the ſeed-ſtalks are never found but in neglected corners, or by the ſides of roads; and are ſo diſagreeable to cattle, that they are never taſted; and thus it has been erroneouſly thought that the whole plant was refuſed by them.—The leaves of this plant have a great tendency to grow very thick upon one another, and are therefore peculiarly adapted for paſturage. It arrives at its greateſt perfection in rich fields that are naturally fit for producing a large and ſucculent crop of graſs. It grows alſo upon clays; and is among the firſt plants that ſtrike root in any barren clay that has been lately dug from any conſiderable depth; ſo that this plant, and thiſtles, are uſually the firſt that appear on the banks of deep ditches formed in a clayey ſoil. All animals delight to eat it; but, from the dry aromatic taſte it poſſeſſes, it would ſeem peculiarly favourable to the conſtitution of ſheep. It ſeems altogether unfit for hay.

67 Lucerne.

Beſides theſe plants, which are natives of Great Britain, there are others, which, though natives of other countries, are found to thrive very well in that climate; and have been raiſed with ſuch ſucceſs by individuals, as highly to merit the attention of every farmer. Among theſe the firſt place is claimed by lucerne.

This is the plant called *medica* by the ancients, becauſe it came originally from Media, and on the culture of which they beſtowed ſuch great care and pains. It hath a perennial root, and annual ſtalks, which in good ſoil, riſe to three feet, or ſometimes more in height: its leaves grow at a joint like thoſe of clover; the flowers which appear in June, are purple, and its pods of a ſcrew-like ſhape, containing ſeeds which ripen in September. All ſorts of domeſtic cattle are fond of this plant eſpecially when allowed to eat it green, and black cattle may be fed very well with the hay made from it; but an exceſs of this food is ſaid to be very dangerous.

Lucerne has the property of growing very quickly after it is cut down, inſomuch that Mr Rocque has moved it five times in a ſeaſon, and Mr Anderſon affirms he has cut it no leſs than ſix times. It is, however, not very eaſily cultivated; in conſequence of which it ſometimes does not ſucceed; and as it dies entirely in the winter, it is perhaps inferior to the feſcue graſſes already mentioned, which, tho' deſpiſed and neglected, might probably yield as rich a crop as lucerne, without any danger of a miſcarriage.

68 Timothy-graſs.

Another graſs was brought from Virginia, where it is a native, and ſown by Rocque in 1663. This graſs is called *Timothy*, from its being brought from New-York to Carolina by one Timothy Hanſon. It grows beſt in a wet ſoil; but will thrive in almoſt any. If it is ſown in Auguſt, it will be fit for cutting in the latter end of May or beginning of June. Horſes are very fond of it, and will leave lucerne to eat it. It is alſo preferred by black cattle and ſheep; for a ſquare piece of land having been divided into four equal parts, and one part ſowed with lucerne, another with ſan-foin, a third with clover, and the fourth with timothy, ſome horſes, black cattle, and ſheep, were turned into it, when the plants were all in a condition for paſturage; and the timothy was eaten quite bare, before the clover, lucerne, or ſan-foin, was touched.

One valuable property of this graſs is, that its roots are ſo ſtrong and interwoven with one another, that they render the wetteſt and ſofteſt land, on which a horſe could not find footing, firm enough to bear the heavieſt cart. With the view of improving boggy lands, therefore, ſo as to prevent their being poached with the feet of cattle, Mr Anderſon recommends the cultivation of this kind of graſs, from which he has little expectation in other reſpects.

SECT. VII. *Of the Diſeaſes of Plants.*

THESE are divided by Tournefort into the following claſſes. 1. Thoſe which ariſe from too great an abundance of juice; 2. From having too little; 3. From its bad qualities; 4. From its unequal diſtribution; and 5. From external accidents.

69 Effects of too great an abundance of juices.

Too great an abundance of juices cauſes at firſt a prodigious luxuriant growth of the vegetable; ſo that it does not come to the requiſite perfection in a due time. Wheat is ſubject, in ſome climates, to a diſeaſe of this kind; it vegetates exceſſively, without ever carrying ripe grain; and the ſame diſeaſe may be artificially produced in any grain, by planting it in too rich a ſoil. Too much rain is apt likewiſe to do the ſame. When a vegetable is ſupplied too abundantly with juices, it is very apt to rot; one part of it overſhadowing another in ſuch a manner as to prevent the acceſs of freſh air: upon which putrefaction ſoon enſues, as has been already obſerved with regard to the feſcue graſſes.

70 Smut in grain.

In graſs, or any herbaceous plant, where the leaves are only wanted, this over luxuriancy cannot be called a diſeaſe, but is a very deſirable property; but in any kind of grain it is quite otherwiſe. Dr Home, in his Principles of Agriculture and Vegetation, claſſes the *ſmut* in grain among the diſeaſes ariſing from this cauſe. He is of opinion, that too great an abundance of juices in a vegetable will produce diſeaſes ſimilar to thoſe occaſioned by repletion in animal-bodies; viz. ſtagnations, corruptions, varices, carioſities, &c. along with the too great luxuriancy we have juſt now mentioned, which he expreſſes by "too great an abundance of water-ſhoots." Hence he is induced to claſs the ſmut among diſeaſes ariſing from this cauſe; it being a corruption happening moſt in rainy ſeaſons, and to weak grain.—Like other contagious diſeaſes, he tells us, the ſmut may be communicated from the infected to healthful grain.

71 How prevented.

As a preventative, he recommends ſteeping the grain in a ſtrong pickle of ſea-ſalt. Beſides the effect which this has upon the grain itſelf, it is uſeful for ſeparating the good from the bad; the beſt ſeed falling to the bottom, and the faulty ſwimming on the top of the liquor.—For the ſame purpoſe, a ley of wood-aſhes and quicklime is recommended by ſome; and, by others, a ſolution of ſaltpetre or copperas; after which the grain is to be dried with ſlacked lime, or dry turf aſhes. This ſolution, however, we can by no means recommend, as it ſeems moſt likely to kill the grain entirely.

72 Diſeaſes from too great moiſture, how prevented.

According to Dr Home, dung is a preventative of diſeaſes ariſing from too great moiſture; in confirmation of which he relates the following experiment. "Two acres of poor ground, which had never got any manure, were fallowed with a deſign to be ſown with wheat; but the ſcheme being altered, ſome dung was laid on a ſmall part of it, and the whole ſowed, after it had got five furrows, with barley. A great quantity of rain fell. The barley on that part which was dunged was very good: but what was on the reſt of the field turned yellow after the rains, and when ripe was not worth the reaping."

73 Diſeaſe peculiar to ſaffron.

The want of nouriſhment in plants may be eaſily known by their decay; in which caſe, the only remedy is, to ſupply them with food, according to the methods we have already directed, or to remove from their neighbourhood ſuch other plants as may draw off the nouriſhment from thoſe we wiſh to cultivate.—In the Memoirs of the Academy of Sciences for 1728, Mr Du Hamel mentions a diſeaſe, which he calls *le mort*, that attacks ſaffron in the ſpring. It is owing to another plant, a ſpecies of trefoil, fixing ſome violet-coloured threads, which are its roots, to the roots of the ſaffron, and ſucking out its juice. This diſeaſe is prevented by digging a trench, which ſaves all the unaffected.

74 Vegetables deſtroyed by inſects.

The bad qualities, or unequal diſtributions, of the juices of plants, are the occaſion of ſo few of the diſeaſes to which vegetables in every country are ſubject, that we forbear to mention them at preſent. Moſt of the diſeaſes of plants are owing to external accidents, particularly to the depredations of inſects.—The inſects by which the greateſt devaſtations are committed in Great Britain are, ſnails, caterpillars, grubs, and flies. The ſnails and caterpillars feed on the leaves and young

75 Inſects deſtroyed by lime-water.

ſhoots; by which means they often totally deſtroy the vegetable. Where the plants are of eaſy acceſs, theſe vermin may be deſtroyed by ſprinkling the vegetable with lime-water; for quick-lime is a mortal poiſon to creatures of this kind, and throws them into the greateſt agonies the moment they are touched with it. On trees, however, where this method cannot ſo well be followed, fumigation is the moſt proper; and, for this purpoſe, nothing is better than the ſmoke of vegetables not perfectly dry. In ſome caſes the eggs of theſe deſtroying creatures may be obſerved, and ought without doubt immediately to be taken away. On the fruit trees, as apples, pears, medlars, on ſome foreſt-trees, the oak and dwarf-maple eſpecially and the white and black thorn in hedges, a kind of little tufts are to be obſerved, reſembling, at firſt ſight, withered leaves twiſted, by a cobweb, about the uppermoſt twigs or branches. Theſe contain a vaſt number of little black eggs, that in the ſpring produce ſwarms of caterpillars which devour every thing. To prevent this, all the twigs on which theſe cobwebs appear ſhould be taken off and burnt as ſoon as poſſible. This ought to be done before the end of March, that none of the eggs be allowed ſufficient time for hatching.

76 Grubs.

The grubs are a kind of worms which deſtroy the corn by feeding upon its roots; they are transformed every fourth year into the beetles called *cock-chaffers*, *may-bugs*, &c. They are very deſtructive when in their vermicular ſtate, and cannot then be deſtroyed becauſe they go deep in the ground. When become beetles, they conceal themſelves under the leaves of trees, where they ſeem aſleep till near ſunſet, when they take their flight. It is only now that they can be deſtroyed, and that by a very laborious method: namely, by ſpreading pack-ſheets below the trees in the day-time when the beetles are in their torpid ſtate, then ſhaking them off and burning them. Some time ago, they made ſuch devaſtations in the county of Norfolk, that ſeveral farmers were entirely ruined by them; one gathered 80 buſhels of theſe inſects from the trees which grew on his farm. It is ſaid that, in 1574, there fell ſuch a multitude of theſe inſects into the river Severn, that they ſtopped and clogged the wheels of the water-mills.

77 Turnip-fly.

Turnips, when young, are apt to be totally deſtroyed by a multitude of little black flies, from thence called the *turnip-fly*. As a preventative of theſe, ſome adviſe the ſeed to be mixed with brimſtone; but this is improper, as brimſtone is found to be poiſonous to vegetables. The beſt method ſeems to be the fumigation of the fields with ſmoke of half dried vegetables. For this purpoſe weeds will anſwer as well as any. This fumigation muſt no doubt be often repeated, in order to drive away the innumerable multitudes of theſe inſects which are capable of deſtroying a large field of turnip.

78 Prevented by fumigation, &c.

Some have ſuppoſed that the fly is either engendered in new dung, or enticed by it; and have therefore adviſed the manure to be laid on in the autumn preceding, by which it loſes all its noxious qualities, while its nutritive ones are retained, notwithſtanding theſe might be ſuppoſed liable in ſome degree to be exhaled by the ſun. This method is ſaid to have been aſcertained by experiments; and it is added, that another material advantage accruing from autumn manuring for turnips is, that all the ſeeds contained in the dung, and which of courſe are carried on the land with it, vegetate almoſt immediately, are moſtly killed by the ſeverity of the winter, and the few that remain ſeldom avoid deſtruction from the plough-ſhare.

79 Various remedies againſt the turnip-fly.

The following method of ſowing has alſo been recommended as a preventative of the fly:—“About Midſummer, take the firſt opportunity when it rains, or there is an apparent certainty of rain approaching, to ſow your turnip-ſeed; if about the full moon, the better. In this caſe, neither harrow, bruſh, nor roll, after ſowing. The natural heat of the ground at that ſeaſon, and the conſequent fermentation occaſioned by copious rain, will give an aſtoniſhingly quick vegetation to the ſeed, which in a few days will be up and out of all danger from the fly. At all events ſow not till it rains; it is better to wait a month, or even longer, for rain, than to ſow (merely for the ſake of ſowing about the uſual time) when the ground is parched with heat. By the ſcorching of the ſun, the oil and vegetative quality of the ſeed are exhauſted; and the few weak plants that come up will be deſtroyed by the fly before they can attain ſtrength to put forth their rough leaves. The fly infeſts the ground abundantly in dry hot weather, but does no injury in rain. The falling rain will ſufficiently waſh the turnip-ſeed into the ground without harrowing it in; which inſtead of merely covering, too often buries this ſmall ſeed at ſo great a depth, as never afterwards to get above ground.”

The following remedies are alſo recommended as having often proved ſucceſsful:—A ſmall quantity of ſoot ſown over the land at their firſt appearance. Branches of elder with the leaves bruiſed, drawn in a grate over them. Muſk mixed with the ſeed before it is ſown. And ſulphur burnt under it, after moiſtening it with water in which tobacco has been ſteeped.

But ſhowers on the plants as ſoon as they appear above ground are eſteemed the beſt preſervatives. They enfeeble and kill the fly, and haſten the plants into the rough leaf, in which ſtate they are out of danger.

The ſweet ſmell of the turnip has been thought to attract the fly; upon which ſuppoſition, the remedy appeared to conſiſt in overpowering that ſmell by one which is ſtrong, fetid, and diſagreeable. Hence it has been recommended, that upon an acre of turnips ſown in the uſual way, a peck or more of dry ſoot be thrown after the ground is finiſhed, and in as regular a way as he ſows the ſeed.

80 Corn butterfly.

Some time ago an inſect, called the *corn-butterfly*, committed ſuch ravages while in its vermicular ſtate, in France, that upwards of 200 pariſhes were ruined by it; and the miniſtry offered a reward to the diſcoverer of an effectual remedy againſt this deſtroying worm. The cure which was at laſt diſcovered, was to heat the corn, in an oven, ſo much as not to deſtroy its vegetative power, but ſufficiently to deſtroy the ſmall worms which made their neſt in the ſubſtance of the grain, and at laſt eat out the ſubſtance ſo completely that nothing could be got from the huſk, even by boiling it in water. It is certain, that though inſects can bear a great deal of cold, they are eaſily deſtroyed by a ſlight degree of heat; nor is the vegetative power of corn eaſily deſtroyed, even when kept for a long time in a pretty ſtrong heat. This method muſt therefore be very effectual for deſtroying all kinds of inſects with which grain is apt to be infected; but care muſt be taken not to apply too great a heat; and the adjuſting of the preciſe degree neceſſary to deſtroy the inſect, without hurting the corn, will be attended with ſome difficulty.

81
The curled diſeaſe in potatoes.

The curled diſeaſe in potatoes has long been a ſubject of inveſtigation and experiment among farmers; and the knowledge of its cauſe and cure ſeems yet to remain a deſideratum. The Agricultural Society of Mancheſter, a few years ago, offered a premium for diſcovering by actual experiment the cauſe of the diſeaſe in queſtion; and a great variety of letters were, in conſequence, addreſſed to them upon the ſubject.—As theſe contain many intereſting obſervations both on the diſeaſe itſelf and the beſt methods hitherto adopted for preventing it, the following abſtract of them may not improperly be introduced in this place.

82
Various methods of prevention.

I. According to the writer of the firſt letter, this diſeaſe is cauſed by an inſect produced by froſt or bad keeping before ſetting; and the neweſt kinds, ſuch as have been raiſed within theſe nine or ten years, are moſt apt to curl, becauſe they will not ſtand to be kept in winter and ſpring before ſetting, as the old kinds will. In autumn 1776, he got up a bed of potatoes to lay by in winter, leaving plenty in the ground as regular as poſſible; and, before the ſeverity of winter came on, covered part of the bed with ſtraw and peaſe-haulm, and left the other part of the bed uncovered. That part of the bed which was covered was quite free from curled ones; but the uncovered part produced a great many curled, owing, as the writer ſays, to froſt and ſeverity of the weather.

II. This writer had about a quarter of an acre of potatoes, well manured with cow and horſe dung, and took the greateſt care in picking the fine ſmooth-ſkinned potatoes for ſets; yet nine out of ten parts were curled. He attributes the cauſe of this diſeaſe to a white grub or inſect, which he found near the root, about half an inch long, with eight or ten legs, its head brown and hard; as upon examining a number of the curled roots, he found them all bitten, chiefly from the ſurface to the root, which of courſe ſtopped the progreſs of the ſap, and threw the leaf into a curl. The uncurled roots were not bitten. He tried a few experiments as follow;—Firſt, he put ſoot to the inſects in the rows for two days; and after that, he put lime to them for the ſame time, but they ſtill kept lively; next he put a little ſalt, which deſtroyed them in a few hours. From which he infers, that if coarſe ſalt were put into the ground at the time the land is preparing for potatoes, it would effectually cure this diſtemper.

III. In this letter, the cauſe of the diſeaſe is attributed to the method of earthing the ſtems while in cultivation; and the branch, ſtriking root into the new earthed-up ſoil, it is ſaid, produces potatoes of ſuch a nature as the year following to cauſe the diſeaſe complained of.

To prevent the diſeaſe, it is recommended to take the ſets from thoſe potatoes that have not bred any from the branch covered; or otherwiſe, to dig the part the ſets are to be raiſed from.

IV. According to this writer, the diſorder proceeds from potatoes being ſet in old-tilled or worn-out ground; for though thoſe potatoes may look tolerably well, yet their ſets will moſt, if not all, produce curled potatoes. Hence he is convinced, that no ſets ought to be uſed from old-tilled or couch-graſs land; and that in order to have good ſets, they ſhould be procured from land that was purpoſely fallowed for them; from freſh ley land, where they are not curled; or from ley land that was burnt laſt ſpring. He directs to plant them on virgin mould, and the potatoes will have no curled ones amongſt them; and to keep them for winter, from any other kind.

To avoid the uncertainty of getting good ſets, he recommends crabs to be gathered from potatoes growing this year on freſh land free from curl, and the next ſpring to ſow them on freſh ley land; and continue to plant their ſets on freſh ley land yearly, which he is convinced will prevent the curl.

All the good potatoes he ſaw this year, either on freſh ley land or on old-tilled land, were raiſed from ſets that grew upon freſh ley land laſt year; and where he has ſeen curled potatoes, he found, upon inquiry, the potato-ſets grew upon old-tilled and worn-out land laſt year. He gives as a general reaſon for the diſorder, that the land is oftener cropt than it had uſed to be, much more corn being now raiſed than formerly.

V. In 1772, this writer planted ſome potatoes by accident full nine inches deep: when taken up, many of the plants were rotted, and a few curled. He kept the whole produce for ſeed, and planted two acres with it in 1773, not quite ſix inches deep. The crop was amazingly great; and he did not obſerve any curled plants among them. In 1774, many of theſe were planted in different ſoils; yet they were ſo infected with the curled diſeaſe, that not one in twenty eſcaped. In 1775, the complaint of this diſeaſe became general. In 1776, it occurred to him that the good crop of 1773 was owing to the accidental deep ſetting of 1772; and that the reaſon why the ſame ſeed became curled in 1774, was their being ſet ſo near the ſurface in 1773; and attributes the diſeaſe to the practice of ebb-ſetting. In 1777, he took ſome potatoes from a crop that was curled the year before, and after cutting the ſets, left them in a dry room for a month. Half were planted in ground dug fourteen days before; the other half, having been ſteeped in a brine made of whitſter's aſhes for two hours, were alſo planted in the ſame land at the ſame time. The ſteeped ones came up ten days before the others, and hardly any miſſed or were curled. The unſteeped ones generally failed, and thoſe few that came up were moſtly curled.

He therefore adviſes as a remedy, 1. That the potatoes intended for next year's ſets be planted nine inches deep. 2. That they remain in the ground as long as the ſeaſon will permit. 3. That theſe ſets be well defended from froſt till the beginning of March. 4. That the ſets be cut a fortnight before planting. 5. That they be ſteeped, as above, two hours in brine or ley. 6. That the dung be put *over* the ſets. And 7. That freſh ſets be got every year from ſandy ſoils near the coaſt, or on the ſhore.

P. S. At planting, the hard dry ſets ſhould be caſt aſide, for they will probably be curled. Curled potatoes always proceed from ſets which do not rot or putreſy in the ground.

VI. This writer had five drills of the old red potatoes, and four of the winter whites, growing at the ſame time in the ſame field. The drills were prepared exactly alike. Among the red not one was curled ; the winter whites were nearly all curled. He ſays he has found by experience, that the red never curl.

VII. Two of the writer's neighbours had their ſets out of one heap of potatoes. They both ſet with the plough, the one early, and the other late in the ſeaſon. Moſt of thoſe early ſet proved curled, and moſt of thoſe ſet late ſmooth ; the latter on clay land.

A few roods of land were alſo planted with ſmall potatoes, which had lain ſpread on a chamber floor all the winter and ſpring, till the middle of May. They were ſoft and withered ; they proved ſmooth and a good crop. Middle-ſized potatoes, withered and ſoft, which had been kept in a large dry cellar, and the ſprouts of which had been broken off three times, produced alſo a ſmooth good crop.

Hence he was led to think a ſuperfluity of ſap, occaſioned by the ſeed being unripe, might cauſe the diſeaſe. To be ſatisfied in this, he aſked the farmer whether he had ſet any of the ſame potatoes this year, and what was the nature of his land ? He told him "he had ; that they had been ſet on his farm fourteen years, without ever curling ; that his ſoil was a poor whitiſh ſand, of little depth ; that he let thoſe he deſigned for keeping grow till they were fully ripe."

Hence he concludes, the only ſure way to prevent the curl is, to let potatoes intended for ſeed ſtand till they are fully ripe, and to keep them dry all winter.

VIII. This writer ſet a quantity of the red potatoes, without having a curled one amongſt them. His method is, when the ſets are cut, to pick out ſuch as are reddeſt in the inſide. On digging them up at Michaelmas, he mixes none of the curled ſeed among the others. The curled are eaſily diſtinguiſhed, by their ſtalks withering two months before the reſt of the crop.

The cauſe of the curled diſeaſe he attributes to potatoes being of late years produced from ſeed inſtead of roots, as formerly. Such will not ſtand good more than two or three years, uſe what method you pleaſe. Laſt ſpring, he ſet the old red and white ruſſets, and had not a curled potato amongſt them.

On the lime-ſtone land about Denbigh, in North Wales, they have no curled potatoes. If this be owing to the nature of that land, perhaps lime might prevent the diſeaſe.

IX. According to this writer, all ſorts of grain wear out and turn wild if ſown too long on the ſame land ; the ſame will hold good in all ſorts of pulſe, peaſe, beans, and (as he conceives) potatoes. It generally happens, that thoſe who have moſt curled potatoes plant very ſmall ſets.

Eleven years ago he bought a parcel of freſh ſets, of the golden-dun kind, and has uſed them without change to the preſent year, without any being curled. This he principally attributes to his having always planted good large ſets.

About forty years ſince, he thought of changing his ſets, as his potatoes were too ſmooth, too round, and much diminiſhed in ſize. But the curl at that time beginning to be very alarming, he continued his ſets till part of his crop miſſing laſt year, he was obliged to buy new ſets this ſpring, which, being ſmall, were curled like other peoples.

He allows, that the curl has frequently happened to perſons who have uſed large potatoes for ſets ; for, as all roots are not equally affected, ſome curled ones may be mixed with the reſt.

To prevent the evil, cut your ſets from clear and middle-ſized potatoes, gathered from places as clear of the curl as poſſible ; preſerve them as uſual till ſpring. If any are harder, or graſh more in cutting than uſual, caſt them aſide. He would alſo recommend the raiſing a freſh ſort from the crab produced on the ſorts leaſt affected, which in Lancaſhire are the long-duns.

X. Set potatoes with the ſprits broke off, and they will (ſays the writer of this letter) be curled ones ; if ſet with the ſprits on, they will not be curled. Again, take a potato which is ſprit, and cut a ſet off with two ſights : break one ſprit off, and let the other ſtay on, and ſet it ; the former will be curled, and the latter will not.

When you have holed your potatoes, take them out before they are ſprit, and lay them dry until you have ſet or ſown them, and you will have no curled potatoes.

XI. This writer was at the expence of procuring ſets at fifty miles diſtance, and where this diſeaſe was not known. The firſt year's trial was ſucceſsful ; the year following he procured ſets from the ſame place, but one-fifth of his crop was infected. By way of experiment, he planted ſets from roots which had been infected the year before, and ſome of theſe produced healthy plants, free from all infection.

As every effect muſt have a cauſe, he ſuppoſed it might be ſome inſect, which, living on the leaves, gave them that curled and ſickly appearance, as is the caſe in the leaves of many ſhrubs and trees. But whether the inſect is lodged in the old ſets, and to be deſtroyed at the time of planting, or, proceeding from ſome external cauſe, can only be deſtroyed afterwards, he is not yet certain, although he has made the following experiments.

On a piece of ground that had not been dug for 20 years, he planted four rows of ſets, which he knew to be perfectly clear ; the drills were two feet diſtant, the ſets one foot diſtant in each drill. He then planted on the ſame ground four rows with ſets from curled potatoes, at equal diſtances ; in each row were about 20 ſets.

Lot 1ſt, the curled ſtate.
N° 1. Without manure,
2. In ſalt,
N° 3. In ſoot,
4. In quicklime.

Lot 2d, the clear ſets.
N° 1. Without manure,
2. In ſalt,
N° 3. In ſoot,
4. In quicklime.

Thoſe planted in ſalt and ſoot in both lots were deſtroyed. In lot 1. n° 1. and 4. all curled. Lot 2. n° 1. and 4. quite clear.

This experiment was made on a ſuppoſition that the inſect lodged in the ſet, and muſt be deſtroyed on planting. But of that he is not fully ſatisfied. He repeated ſalt, ſoot, and quicklime, on the branches of ſeveral curled potatoes. Salt deſtroyed all he touched with it. Lime and ſoot had, he thought, a partial effect on the plants. After ſome time, they appeared almoſt as healthy as the reſt. Thus, although he had done little towards the cure, he flatters himſelf he has pointed out the cauſe, the inſects on the curled plants being not only very numerous, but viſible to the naked eye.

XII. This writer aſcribes the cauſe of the diſeaſe to the froſt, and bad keeping in winter and ſpring before ſetting. They are liable to be damaged by froſt after they are ſet, but this may be prevented by covering. If it be aſked, why froſt did not injure them formerly? he anſwers, it is only the NEW kinds which are apt to curl. To this may be added, that leſs care is now taken of the ſeed than formerly. To prevent the latter, let them remain in the ground covered with haulm or litter, till the time they are wanted for ſetting; and, in caſe no froſt touches them afterwards, they will be free from the diſeaſe.

XIII. This writer ſays, the red potato was as generally planted as the winter-white and the Lincolnſhire kidney are now. The firſt, being a later potato, did not ſprout ſo early as the others. The white ſprout very early, and therefore ſhould firſt be moved out of the place where they have been preſerved in the winter. Inſtead of that, they are often let remain till their roots and ſprouts are matted together. On ſeparating them, theſe ſprouts are generally rubbed off, and they are laid by till the ground is ready; during which interval they ſprout a ſecond time; but theſe ſecond ſprouts, being weak and languid, will ſhrink, ſicken, and die; and the fruit at the roots will be ſmall, hard, ill ſhaped, and of a brown colour.

Now, if putting off the ſprouts once or more, before the ſets are put in the ground, be the cauſe (as he verily believes it is) of the curly diſeaſe, an eaſy remedy is at hand. When the potatoes intended for ſets are dug up, lay them in a weſt aſpect as dry as poſſible: in ſuch a ſituation they will not ſprout ſo ſoon. The beſt time for removing moſt ſorts, is the firſt fine day after the 29th of February. Cut them into ſets as ſoon as poſſible, and let them remain covered with dry ſand till the ground is prepared, which ſhould be a winter fallow. Lay the ſets in without breaking off any of the ſprouts, for the ſecond will not be ſo vigorous. This accounts for one ſprout out of three from the ſame ſet being curled. The two ſtems not curled roſe from two later eyes, and were firſt ſprouts. The ſprout curled was a ſecond, the firſt having been rubbed off.

XIV. This writer ſays, that laſt ſpring one of his neighbours cut and ſet, in the uſual way of drilling, ſome loads of the largeſt potatoes he could procure; and more than half of them proved curled. Being a few ſets ſhort of the quantity wanted, he planted ſome very ſmall potatoes which he had laid by for the pigs. Theſe being fully ripe and ſolid, there was not a curled plant among them. He apprehends, the others being curled, was owing to their not being fully ripe. A crop of potatoes, ſet this year in rows on ground that had borne a crop of them laſt year, were moſtly curled; but many plants came up from ſeed left in the ground laſt ſeaſon, and there was not a curled one among them.

XV. Of late years, this writer ſays, great improvements have been made in ſetting potatoes and cutting the ſets. The ground is dreſſed cleaner and dunged ſtronger. Many people, in drilling, wrap up the ſets entirely in the dung; by which means, though their potatoes are larger, the diſeaſe ſeems to be increaſed. They alſo cut their ſets out of the richeſt and largeſt potatoes, which is perhaps another cauſe of this evil. In cold countries, where they ſet their own ſeed, which has grown on poor land, with leſs dung, they have no curled plants. On the contrary, when they bought rich and large potatoes for ſeed, they have been curled in great quantities. He believes, the richneſs and largeneſs of the ſeed to be the cauſe of the evil; for he does not remember to have ſeen a curled ſtem which did not ſpring from a ſet of a large potato.

XVI. This writer apprehends the curled diſeaſe in potatoes to proceed from a defect in the *planta ſeminalis*, or ſeed-plant; and from comparing curled ones with others, there appeared to be a want of, or inability in, the powers of expanding or unfolding the parts of the former; which, from this defect, forms ſhrivelled, ſtarved, curled ſtems. On examining ſome of the ſets at the time of getting the crop, he found them hard and undecayed; ſo hard, indeed, that ſome of them would not be ſoft with long boiling. This led him to think, that ſome manures might have the ſame effect on them as tanners ooze has on leather, and ſo harden them, that the embryo plant could not come forth with eaſe; but a cloſer examination taught him otherwiſe, and that they grew equally in all manures.

Some have thought that the fermentation is occaſioned by too great quantities being heaped together; but the writer has ſeen an inſtance, wherein a ſingle potato, preſerved by itſelf, when ſet, produced ſtems of the curled kind. He thinks the moſt conſiſtent and rational opinion is, that the diſeaſe is occaſioned by the potatoes being taken from the ground before the ſtamen, or miniature-plant, is properly matured and ripened.

For let it be obſerved, that the potato, being a native of a warm climate, has there much ſun, and a long continuance in the ground; conſequently, it has not the ſame natural cauſes in a cold climate to mature the ſeed-plant as in its native ſtate. All the opportunities, therefore, ought to be given which the climate will admit for nature to complete her work, and fit the ſtamen for the next ſtate of vegetation, eſpecially in thoſe intended for ſeed. But if the potato be taken up before the ſeed-plant be fully matured, or the air and ſap-veſſels have acquired a proper degree of firmneſs or hardneſs, it muſt, when thus robbed of further nutrition, ſhrivel up; and when the veſſels, in this immature ſtate, come to act again in the ſecond ſtate of vegetation, they may produce plants which are curled.

If it be aſked, why are they more common now than formerly? he anſwers, that before the preſent mode of ſetting them took place, people covered them, while in the ground, with ſtraw, to protect them from froſt.

If it be aſked, why one ſet produces both curled and ſmooth ſtems? he anſwers—We ſuppoſe every eye to contain a *planta ſeminalis*; that all the embryos, or ſeed-plants, contained in one potato, are nouriſhed by one root; that, as in ears of corn, ſome of theſe ſeed-plants may be nouriſhed before others.

One of his neighbours, laſt year, ſet two rows of potatoes, which proving all curled, he did not take them up; and this year there is not a curled one among them. Such potatoes, therefore, as are deſigned for ſeed, ſhould be preſerved as long in the ground as poſſible.

XVII. This writer adviſes ſuch ſets to be planted as grow in moſs-land; and, he ſays there will not be a ſingle curled one the firſt year. This is affirmed by the inhabitants of two townſhips, where they grow amazing quantities.—A medical gentleman ſowed laſt year two buſhels of ſets from one of the above places, and had not one curled; but on ſowing them again this year, he had a few.

Notwithſtanding there ſeems to be a diverſity of opinions in the above writers, occaſioned by the different appearances of their crops, and the ſeemingly contrary effects of the means uſed to prevent or cure the diſeaſe, we conceive that the following general propoſitions may be fairly drawn from the whole. 1. That ſome kinds of potatoes are (*cæteris paribus*) much more liable to be affected by the diſeaſe than the reſt; and that the old-red, the golden-dun, and the long-dun, are the moſt free from it.—2. That the diſeaſe is occaſioned by one or more of the following cauſes, either ſingly or combined: 1ſt, By froſt, either before or after the ſets are planted: 2d, From planting ſets out of large unripe potatoes: 3d, From planting too near the ſurface, and in old worn-out ground: 4th, From the firſt ſhoots of the ſets being broken off before planting; by which means there is an incapacity in the *planta ſeminalis* to ſend forth others ſufficiently vigorous to expand ſo fully as they ought.—3. That the moſt ſucceſsful methods of preventing the diſeaſe, are cutting the ſets from ſmooth middle-ſized potatoes, that were fully ripe, and had been kept dry after they were taken out of the ground; and without rubbing off their firſt ſhoots, planting them pretty deep in freſh earth, with a mixture of quicklime, or in lime-ſtone land.

A correſpondent of the Bath Society is convinced that, whatever may be its cauſe, the fault itſelf is inherent in the ſeed; and has communicated the following method of avoiding it: "I made a hot-bed in the following manner: (which method I have uſed ever ſince) I laid horſe-dung, &c. (as is generally uſed in making hot-beds) about 18 inches thick; over which I ſpread a layer of fine rich mould about four or five inches thick: upon the top of this mould I laid, in different diviſions, a certain number of potatoes of various ſorts, ſome of my own growth, and others brought from different parts, and covered theſe lightly over with more mould; they ſoon came up. I then obſerved which was freeſt from the blight or curl; for if there were not more than one defective in *forty* or *fifty*, I concluded I might ſet of that ſort with ſafety. This method I have now practiſed near twelve years, and never loſt my crop or any part thereof worth mentioning; whilſt my neighbours, who followed the old method, were frequently diſappointed in their crops; and to the beſt of my knowledge, all thoſe of my neighbours who have of late been perſuaded to take the trouble of uſing the ſame means as myſelf, have never failed of ſucceſs to their utmoſt wiſhes in one inſtance; nor do I ever think it will fail, if duly attended to; the fault being ſome hidden cauſe in the ſeed unknown at preſent, and I believe incurable by any means, at leaſt which have yet come to my knowledge. My reaſon for planting my hot-beds ſo ſoon is, that if the froſt hinders the firſt experiment, or they all prove bad, I may have time to make a ſecond or third if neceſſary, with different ſorts of ſeed, before the proper ſeaſon arrives for planting in the fields and grounds appointed for the great and general crop."

PART II. PRACTICE OF AGRICULTURE.

SECT. I. *Inſtruments of Huſbandry.*

THE inſtruments employed in agriculture are various; as the plough, the harrow, the roller, &c. which are again greatly diverſified by various conſtructions adapted to particular uſes.

1. Of PLOUGHS.

83 Scots plough. THE plough conſtructed in the following manner is ſtill the moſt common and the moſt generally underſtood in Scotland; and, if properly made, is the beſt for anſwering all purpoſes, when only one is uſed; though others are, perhaps, more proper on ſome particular occaſions.

84 Deſcription of the Scots plough. The parts of which this plough is compoſed, are, the head, the beam, the ſheath, the wreſt, the mould-board, the two handles, the two rungs, the ſock, and the coulter; the two laſt are made of iron, and all the reſt of wood.

Plate V. fig. 1. The HEAD, is deſigned for opening the ground below. The length of the head from A to B is about 20 inches, and the breadth from A to D about five inches; C is the point upon which the ſock is driven, and the length from B to C is about ſix inches; *a* is the mortoiſe into which the larger handle is fixed, and *b* is the mortoiſe into which the ſheath is fixed.

The head is that part of the plough which goes in the ground; therefore the ſhorter and narrower it is, the friction will be the leſs, and the plough more eaſily drawn; but the longer the head is, the plough goes more ſteadily, and is not ſo eaſily put out of its direction by any obſtructions that occur. Twenty inches is conſidered as a mean length; and five inches as the moſt convenient breadth.

Fig. 2. The SHEATH, E, is driven into the mortoiſe *b*, and thus fixed to the head A B. It is not perpendicular to the head, but placed obliquely, ſo as to make the angle formed by the lines A B and E B about 60 degrees. The ſheath is about 13 inches long, beſides what is driven into the mortoiſe *b* (fig. 1.); about three inches broad, and one inch thick.

The ſheath is fixed to the mould-board, as in fig. 11. E, in the ſame manner as the wreſt is fixed to the head in fig. 7.

Fig. 3. The MOULD-BOARD, is deſigned to turn over the earth of the furrow made by the plough; and it is obvious, that, according to the poſition of the ſheath, the mould-board will turn over the earth of the furrow more or leſs ſuddenly. Beſides, when it forms a leſs angle with the head than 60 degrees, the plough is in great danger of being *choked*, as the farmers term it.

Fig. 3. The Larger Handle, FA, is fixed to the head, by driving it into the mortoiſe *a* (fig. 1.). It is placed in the ſame plane with the head; and its length from AF is about five feet four inches, and its diameter at the place where it is fixed to the beam is about two inches and an half, and tapers a little to the top F. About ten inches from A, there is a curve in the handle, which, when F is raiſed to its proper height, makes the lower part of it nearly parallel to the ſheath E B. This curve is deſigned to ſtrengthen the handle. The proper poſition of the handle is, when the top F is about three feet two inches higher than the bottom of the head A B.

The longer the handles, the plough is the more eaſily managed, becauſe the levers are more diſtant from the centre of motion. The higher the top of the handles, the plough is more eaſily raiſed out of the ground, provided they be no higher than the lower part of a man's breaſt.

Fig. 4. The Beam, is fixed to the larger handle and the ſheath, all of which are placed in the ſame plane with the head. The length of it, from H to I, is about ſix feet; its diameter is about four inches. When the plough is in the ground, the beam ſhould be juſt high enough not to be incommoded by any thing on the ſurface.

The poſition of the beam depends on the number of cattle in the plough. When two horſes are yoked, the beam ſhould be placed in ſuch a manner as to make the perpendicular diſtance betwixt the bolt-hole of the beam and the plane of the head about 21 inches; when four horſes are yoked, two a-breaſt, this diſtance ſhould only be about 18 inches.

Fig. 5. The Sock, BP, is fixed to the end of the head, and is about two feet long. In fitting the ſock to the head, the point ought to be turned a little to the land or left ſide; becauſe otherwiſe it is apt to come out of the land altogether. When turned to the left, it likewiſe takes off more land; when turned upwards, the plough goes ſhallow; and when downwards, it goes deeper.

Fig. 6. The Coulter, is fixed to the beam, and is about two feet ten inches long, two inches and a half broad, ſharp at the point and before, and thick on the back, like a knife. It is fixed and directed by wedges, ſo as to make the point of it equal to, or rather a little before the point of the ſock, and upon a line with the left ſide of the head. This oblique poſition enables it to throw roots, &c. out of the land, which requires leſs force than cutting or puſhing them forward.

Fig. 7. The Wrest, BD, is fixed to the head, and is about 26 inches long, two broad, and one thick. It is fixed to the head at B, in ſuch a manner as to make the angle contained between the lines AB and BD about 25 degrees. The wreſt is ſeldom or never placed in the ſame plane with the head, but gradually riſes from the place where it is fixed to it; that is, from B to K, as in fig. 8. The poſition of the wreſt determines the nature of the furrow. When the wreſt is wide and low ſet, the furrow is wide; and when it is narrow and high ſet, the furrow is narrow.

Fig. 9. repreſents the two Handles, fixed together by the two rungs. The larger handle has already been deſcribed; the leſſer one is a few inches ſhorter, and does not require to be quite ſo ſtrong. The diſtance of the handles at the little rung depends on the poſition of the wreſt. Their diſtance at M and P is about two feet ſix inches. The leſſer handle is fixed to the mould board at M, fig. 10. and to the wreſt K B, at L.

Fig. 11. repreſents the plough complete, by joining together figures 6 and 10. in the ſheath E B. The wreſt B K is ſuppoſed to make an angle with the head AB as in fig. 7. and the handles joined together as in fig. 9.

After having given ſuch a particular deſcription of all the parts and proportions of the Scotch plough, it will eaſily appear how it ſeparates, raiſes, and turns over the earth of the furrow. If it had no coulter, the earth would open above the middle of the ſock, and in a line before the ſheath; but as the coulter opens the earth in a line with the left ſide of the head, if the ſoil has any coheſion, the earth of the furrow will be wholly raiſed from the left ſide, and, as the ſock moves forward, will be thrown on the right ſide of the ſheath, and by the caſting out of the mould-board, or the raiſing of the wreſt, will be turned over.

Fig. 12. The Bridle, or Muzzle, is another article belonging to the plough. It is fixed to the end of the beam, and the cattle are yoked by it. The muzzle commonly uſed is a curved piece of iron, fixed to the beam by a bolt through it. A B C is the muzzle, A C the bolt by which it is fixed to the beam; D is the ſwingle-tree or croſs-tree, to which the traces are fixed; and B is a hook, or *cleek*, as it is commonly called, which joins the muzzle and ſwingle-tree.

Fig. 13. Some uſe another kind of muzzle, A B C D. It is fixed to the beam by two bolts, and has notches by which the cleek of the ſwingle-tree may be fixed either to the right or the left of the beam. There are alſo different holes for the hind-bolt to paſs through, by which the draught may be fixed either above or below the beam. A D is the fore-bolt upon which the muzzle turns; on B C are four notches, betwixt any two of which the cleek of the ſwingle-tree may be fixed. When the cleek is fixed at B, the plough is turned towards the firm land, and takes off a broader furrow; and when fixed at C, it is turned towards the ploughed land, and takes off a narrower furrow. E and F are the holes on each ſide thro' which the hindmoſt bolt paſſes. When the bolt is put thro' the higheſt two, theſe holes being thereby brought to the middle of the beam, the fore-part of the muzzle is raiſed above the beam, and the plough is made to go deeper; and when put through the loweſt two, the fore-part of the muzzle is ſunk below the beam, and the plough is made to go ſhallower. This muzzle may be ſo conſtructed as to have the ſame play with the common one. Fig. 16. A is the end of the beam; B a plate of iron ſunk into it, and, with a ſimilar one in the other ſide, is rivetted into it by bolts; C is the muzzle fixed to theſe plates of iron by the bolt D, which bolt may be put through any of the holes E E. From the conſtruction of this muzzle it is plain, that it has the ſame play with the common one, and that by it the land of the plough may be altered at pleaſure.

85

Properties of the Scotch plough.

Of all forms, that of the Scotch plough is the fitteſt for breaking up ſtiff and rough land, eſpecially where ſtones abound; and no leſs fit for ſtrong clays hardened by drought. The length of its head gives it a firm hold of the ground; its weight prevents it from being thrown out by ſtones; the length of the handles gives the ploughman great command to direct its motion;

tion; and by the length of its head, and of its mould-board, it lays the furrow-ſlice cleverly over. This plough was contrived during the infancy of agriculture, and was well contrived: in the ſoils above deſcribed, it has not an equal.

86
In what ſoil improper.

But in tender ſoil it is improper, becauſe it adds greatly to the expence of ploughing, without any counterbalancing benefit. The length of the head and mould-board increaſes the friction, and conſequently it requires a greater number of oxen or horſes than are neceſſary in a ſhorter plough. There is another particular in its form, that reſiſts the draught: the mould-board makes an angle with the ſock, inſtead of making a line with it gently curved backward. There is an objection againſt it no leſs ſolid, that it does not ſtir the ground perfectly: the hinder part of the wreſt riſes a foot above the ſole of the head; and the earth that lies immediately below that hinder part, is left unſtirred. This is ribbing land below the ſurface, ſimilar to what is done by ignorant farmers on the ſurface.

Theſe defects muſt be ſubmitted to in a ſoil that requires a ſtrong heavy plough; but may be avoided in a cultivated ſoil by a plough differently conſtructed. Of all the ploughs fitted for a cultivated ſoil free of ſtones, that introduced into Scotland about 20 years ago, by James Small in Blackadder Mount, Berwickſhire, is the beſt. It is now in general requeſt; and with reaſon, as it avoids all the defects of the Scotch plough. The ſhortneſs of its head and of its mould-board leſſen the friction greatly: from the point of the ſock to the back part of the head it is only 30 inches; and the whole length, from the point of the beam to the end of the handles, between eight and nine feet. The ſock and mould-board make one line gently curving; and conſequently gather no earth. Inſtead of a wreſt the under edge of the mould-board is in one plane with the ſole of the head; which makes a wide furrow, without leaving any part unſtirred. It is termed the *chain-plough*, becauſe it is drawn by an iron chain fixed to the back part of the beam immediately before the coulter. This has two advantages: firſt, by means of a muzzle, it makes the plough go deep, or ſhallow; and, next, it ſtreſſes the beam leſs than if fixed to the point, and therefore a ſlenderer beam is ſufficient.

87
Chain-plough.
Plate VI. fig. 1.

This plough may well be conſidered as a capital improvement; not only by ſaving expence, but by making better work. It is proper for loams; for coarſe-clays; and, in general, for every ſort of tender ſoil free of ſtones. It is even proper for opening up paſture-ground, where the ſoil has been formerly well cultivated.

88
Of the ſock
Plate V.

A ſpiked ſock is uſed in the Scotch plough. The difference between it and the feathered ſock will be beſt underſtood by comparing their figures. Fig. 14. is the common ſock, and fig. 15. the feathered one.

From the conſtruction of the feathered ſock, it is obvious, that it muſt meet with greater reſiſtance than the common ſock. However, when the plough takes off the earth of the furrow broader than that part of the ſock which goes upon the head, it is more eaſily drawn than the plough with the common ſock; for the earth which the common ſock leaves to be opened by the wreſt, is more eaſily opened by the feather of the other ſock. In ley, the feathered ſock makes the plough go more eaſily, becauſe the roots of the graſs, which go beyond the reach of the plough are more eaſily cut by the feather, than they can be torn aſunder by the common ſock. The feathered ſock is alſo of great uſe in cutting and deſtroying root-weeds. The common ſock, however, anſwers much better in ſtrong land.

It is proper here to add, that in fitting the feathered ſock to the head, the point of it ſhould be turned a little from the land, or a little to the right hand.

89
Ignorance of farmers in Scotland but a few years ago.

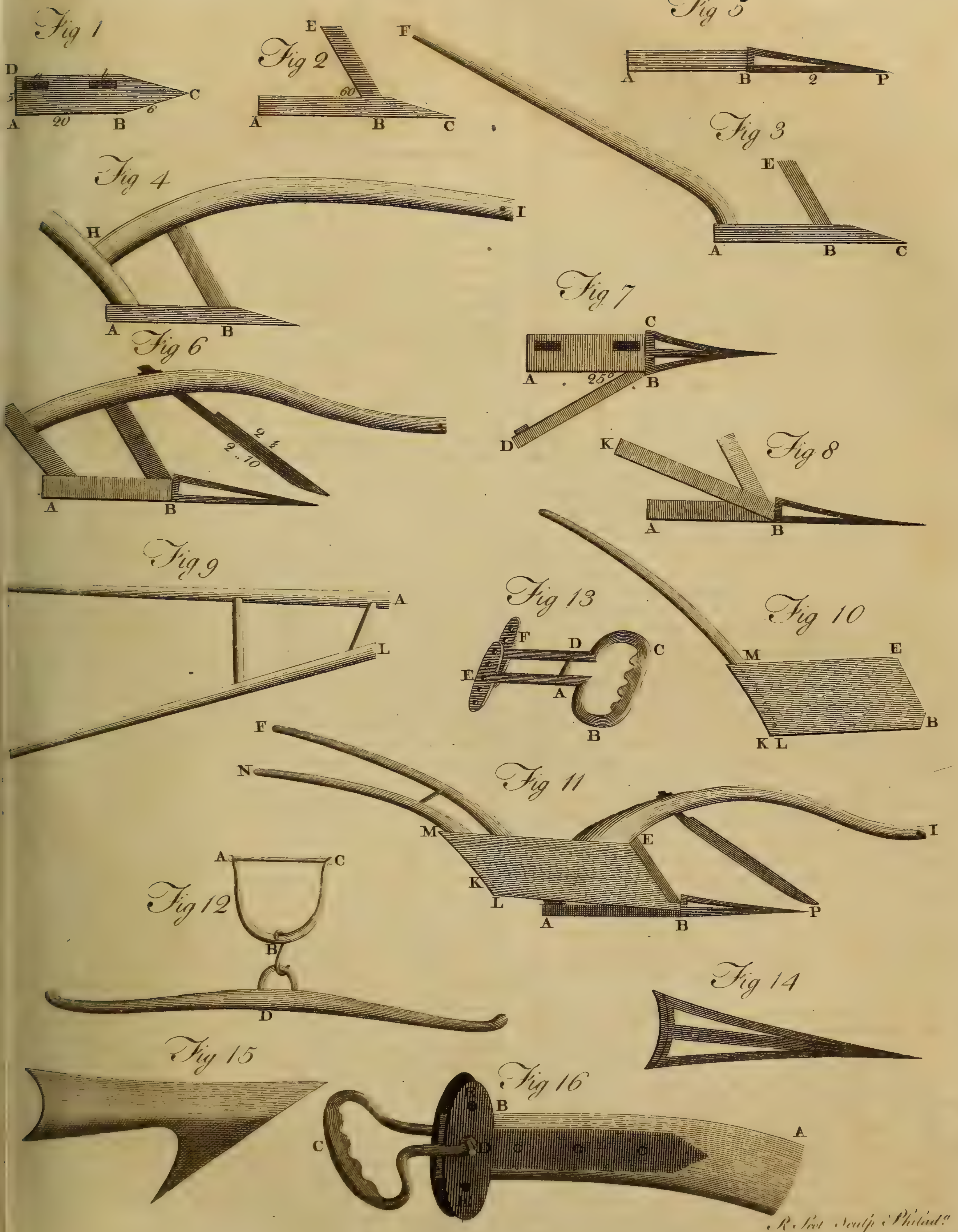
If we look back 30 years, ploughs of different conſtructions did not enter even into a dream. The Scotch plough was univerſally uſed, and no other was known. There was no leſs ignorance as to the number of cattle neceſſary for this plough. In the ſouth of Scotland, ſix oxen and two horſes were univerſal; and in the north, 10 oxen, ſometimes 12. The firſt attempt to leſſen the number of oxen was in Berwickſhire. The low part of that county abounds with ſtone, clay, and marle, the moſt ſubſtantial of all manures, which had been long uſed by one or two gentlemen. About 25 years ago it acquired reputation, and ſpread rapidly. As two horſes and two oxen were employed in every marle-cart; the farmer, in ſummer fallowing, and in preparing land for marle, was confined to four oxen and two horſes. And as that manure afforded plenty of ſucculent ſtraw for oxen, the farmer was ſurpriſed to find that four oxen did better now than ſix formerly. Marling, however, a laborious work, proceeded ſlowly, till people were taught by a noted farmer in that country, what induſtry can perform by means of power properly applied. It was reckoned a mighty taſk to marle five or ſix acres in a year. That gentleman, by plenty of red clover for his working-cattle, accompliſhed the marling 50 acres in a ſummer, once 54. Having ſo much occaſion for oxen, he tried with ſucceſs two oxen and two horſes in a plough; and that practice became general in Berwickſhire.

90
Advantages of the chain-plough particularly illuſtrated.

Now here appears with luſtre the advantage of the chain-plough. The great friction occaſioned in the Scotch plough by a long head, and by the angle it makes with the mould-board, neceſſarily requires two oxen and two horſes, whatever the ſoil be. The friction is ſo much leſs in the chain-plough, that two good horſes are found ſufficient in every ſoil that is proper for it. Beſides, the reducing the draught to a couple of horſes has another advantage, that of rendering a driver unneceſſary. This ſaving on every plough, where two horſes and two oxen were formerly uſed, will, by the ſtricteſt computation, be L. 15 Sterling yearly; and where four horſes were uſed, no leſs than L. 20 Sterling. There is now ſcarce to be ſeen in the low country of Berwickſhire a plough with more than two horſes; which undoubtedly in time will become general. We know but of one further improvement, that of uſing two oxen inſtead of two horſes. That draught has been employed with ſucceſs in ſeveral places; and the ſaving is ſo great, that it muſt force its way every where. It may be confidently affirmed, no ſoil ſtirred in a proper ſeaſon, can ever require more than two horſes and two oxen in a plough, even ſuppoſing it the ſtiffeſt clay. In all other ſoils, two good horſes, or two good oxen abreaſt, may be relied on for every operation of the chain-plough.

A chain-plough of a ſmaller ſize than ordinary,

Plate V



R. Scot Sculp Philada

drawn by a ſingle horſe, is of all the moſt proper for horſe-hoeing, ſuppoſing the land to be mellow, which it ought to be for that operation. It is ſufficient for making furrows to receive the dung, for ploughing the drills after dunging, and for hoeing the crop.

91 A ſmall ſingle horſe plough recommended for various purpoſes.

A ſtill ſmaller plough of the ſame kind may be recommended for a kitchen-garden. It can be reduced to the ſmalleſt ſize, by being made of iron; and where the land is properly dreſſed for a kitchen-garden, an iron plough of the ſmalleſt ſize drawn by a horſe will ſave much ſpade-work.—In Scotland, thirty years ago, a kitchen-garden was an article of luxury merely, becauſe at that time there could be no cheaper food than oat-meal. At preſent, the farmer maintains his ſervants at double expence, as the price of oat-meal is doubled; and yet he has no notion of a kitchen-garden more than he had thirty years ago. He never thinks, that living partly on cabbage, kail, turnip, carrot, would ſave much oat-meal: nor does he ever think, that change of food is more wholeſome, than vegetables alone, or oat-meal alone. We need not recommend potatoes, which in ſcanty crops of corn have proved a great bleſſing: without them, the labouring poor would frequently have been reduced to a ſtarving condition. Would the farmer but cultivate his kitchen-garden with as much induſtry as he beſtows on his potato crop, he needed never fear want; and he can cultivate it with the iron plough at a very ſmall expence. It may be held by a boy of 12 or 13: and would be a proper education for a ploughman. But it is the landlord who ought to give a beginning to the improvement. A very ſmall expence would incloſe an acre for a kitchen-garden to each of his tenants; and it would excite their induſtry, to beſtow an iron plough on thoſe who do beſt.

Nor is this the only caſe where a ſingle-horſe plough may be profitably employed. It is ſufficient for ſeed-furrowing barley, where the land is light and well-dreſſed. It may be uſed in the ſecond or third ploughing of fallow, to encourage annual weeds, which are deſtroyed in ſubſequent ploughings.

92 Rotheram Plough, Plate VII. fig. 3.

The *Rotheram plough* is a machine of very ſimple conſtruction, and eaſily worked. AB is the beam, CD the ſheath, EBD the main handle, FR the ſmaller handle, GH the coulter, KI the ſock or ſhare, NP the bridle, S the ſly-band, and ML a piece of wood in place of a head. The whole of this plough ſhould be made of aſh or elm; the irons ſhould be ſteeled and well-tempered; and that part of the plough which is under ground in tilling ſhould be covered with plates of iron. The difference between this and the common plough ſeems to conſiſt in the bridle at the end of the beam, by which the ploughman can give the plough more or leſs land by notches at N, or make it cut deeper or ſhallower by the holes at P; in the coulter or ſhare, which are ſo made and ſet as to cut off the new furrow without tearing; and in the mould-board, which is ſo ſhaped at firſt to raiſe a little, and then gradually turn over the new cut furrow with very little reſiſtance. But the greateſt advantage attending it, is its being ſo eaſy of draught, that it will do double the work of any common plough.

93 The Paring Plough Plate VII. fig. 4.

The *Paring-plough* is an inſtrument uſed in ſeveral parts of England for paring off the ſurface of the ground, in order to its being burnt. Mr Bradley has given the following deſcription of a very ſimple inſtrument of this kind: From A to A (fig. 4.) is the plough-beam, about ſeven feet long, mortiſed and pinioned into the block B, which is of clean timber without knots. C C are the ſheaths or ſtandards, made flat on the inſide, to cloſe equally with the paring plate, and faſtened to it with a bolt and key on each ſide, as at D. E is the paring plate of iron laid with ſteel, about four inches wide, and from 12 to 18 inches long. This plate muſt be made to cut on the ſides, which are bolted to the ſtandards as well as at the bottom part. FF are two iron braces to keep the ſtandards from giving way: theſe ſtandards muſt be mortiſed near their outſides and through the block. GG are the plough handles, which muſt be fixed ſlope-ways between the beam and the ſtandards. The pin-holes in the beam, the uſe of which is to make the plough cut more or leſs deep, by fixing the wheels nearer to or farther from the paring plate, ſhould not be above two inches aſunder.

94 The Four-coultered Plough, Plate VII.

Fig. 1. repreſents the four-coultered plough of Mr Tull. Its beam is ten feet four inches long, whereas that of the common plough is but eight. The beam is ſtraight in the common plough, but in this it is ſtraight only from *a* to *b*, and thence arched: ſo that the line let down perpendicularly from the corner at *a*, to the even ſurface on which the plough ſtands, would be 11½ inches; and if another line were let down from the turning of the beam at *b* to the ſame ſurface, it would be one foot eight inches and a half; and a third line let down to the ſurface from the bottom of the beam at that part which bears upon the pillow, will ſhow the beam to be two feet ten inches high in that part. At the diſtance of three feet two inches from the end of the beam *a*, at the plough-tail, the firſt coulter, or that next the ſhare, is let through; and at 13 inches from this, a ſecond coulter is let through; a third at the ſame diſtance from that; and, finally, the fourth at the ſame diſtance from the third, that is, 13 inches: and from *a* to *b* is ſeven feet.

The crookedneſs of the upper part of the beam of this plough is contrived to avoid the too great length of the three foremoſt coulters, which would be too much if the beam was ſtraight all the way; and they would be apt to bend and be diſplaced, unleſs they were very heavy and clumſy. Aſh is the beſt wood to make the beam of, it being ſufficiently ſtrong, and yet light. The ſheat in this plough is to be ſeven inches broad. The fixing of the ſhare in this, as well as in the common plough, is the niceſt part, and requires the utmoſt art of the maker; for the well-going of the plough wholly depends upon the placing this. Suppoſing the axis of the beam, and the left ſide of the ſhare, to be both horizontal, they muſt never be ſet parallel to each other: for if they are, the tail of the ſhare bearing againſt the trench as much as the point, would cauſe the point to incline to the right hand, and it would be carried out of the ground into the furrow. If the point of the ſhare ſhould be ſet ſo, that its ſide would make an angle on the right ſide of the axis of the beam, this inconvenience would be much greater; and if its point ſhould incline much to the left, and make too large an angle on that ſide with the axis of the beam, the plough would run quite to the left hand;

and if the holder, to prevent its running quite out of the ground, turns the upper part of his plough towards the left hand, the pin of the ſhare will riſe up, and cut the furrow diagonally, leaving it half unploughed. To avoid this and ſeveral other inconveniences, the ſtraight ſide of the ſhare muſt make an angle upon the left ſide of the beam; but that muſt be ſo very acute a one, that the tail of the ſhare may only preſs leſs againſt the ſide of the trench than the point does. This angle is ſhown by the pricked lines at the bottom of fig. 9. where *ef* is ſuppoſed to be the axis of the beam let down to the ſurface, and *gf* parallel to the left ſide of the ſhare: and it is the ſubtenſe *eg* that determines the inclination which the point of the ſhare muſt have towards the left hand. This ſubtenſe, ſays Mr Tull, at the fore-end of an eight-feet beam, ſhould never be more than one inch and a half, and whether the beam be long or ſhort, the ſubtenſe muſt be the ſame.

The great thing to be taken care of, is the placing the four coulters; which muſt be ſo ſet, that the four imaginary places deſcribed by their four edges, as the plough moves forward, may be all parallel to each other, or very nearly ſo; for if any one of them ſhould be very much inclined to, or ſhould recede much from either of the other, then they would not enter the ground together. In order to place them thus, the beam muſt be carefully pierced in a proper manner. The ſecond coulter-hole muſt be two inches and a half more on the right hand than the firſt, the third muſt be as much more to the right of the ſecond, and the fourth the ſame meaſure to the right hand of the third; and this two inches and a half muſt be carefully meaſured from the centre of one hole to the centre of the other. Each of theſe holes is a mortiſe of an inch and quarter wide, and is three inches and a half long at the top, and three inches at the bottom. The two oppoſite ſides of this hole are parallel to the top and bottom, but the back is oblique, and determines the obliquity of the ſtanding of the coulter, which is wedged tight up to the poll. The coulter is two feet eight inches long before it is worn; the handle takes up ſixteen inches of this length, and is allowed thus long, that the coulter may be driven down as the point wears away. As to the wheels, the left hand wheel is 20 inches diameter, and that on the right hand two feet three inches, and the diſtance at which they are ſet from each other is two feet 5½ inches.

2. The PATENT SWARD-CUTTER.

94
Patent Sward cutter, Plate VII.

THE different parts of this inſtrument are repreſented by N° 1. 2. 3. of fig. 6. A. A. &c. a ſquare frame 3 feet 4 inches from the fore to the hind part, by 4 feet 3 inches, the breadth of the machine within ſide; the timber (when of fir) 4 inches ſquare, placed on two wheels B. B. 3 feet diameter, a little more or leſs (the old fore-wheels of a chaiſe may anſwer the purpoſe), to ſupport the hind part of the machine.

C. C. &c. are ſix ſtrong pieces of wood, called *bulls*, 3 feet long, 5 inches and a half broad, the thickneſs 6 inches at E, and tapering to 3 inches at F. Into theſe bulls are fixed the cutting wheels, which are iron, 13 inches diameter, ¾ths of an inch thick at the centre, about an inch diameter for piercing holes to fix the iron axles in; from that they are to be of ſuch thickneſs, as to allow the edges to be well ſteeled. The wheels are fixed by two bolts going through the bulls, with eyes on one end for the axles of the wheels to run in, and nuts and ſcrews on the other to make them very firm, and ſunk in the bulls, to prevent their interfering with the weights L. L. &c. reſting on them.

G. G. &c. are hollow pieces of wood, called *thorles*, each 3½ inches long, which incloſe the bolt M. M. and keep the bulls C. C. &c. at their proper diſtances, but may be made longer or ſhorter at pleaſure, according as the ſward requires to be cut in larger or ſmaller pieces. They are in two pieces bound together, and jointed by a ſtrap of leather or cord, which allows them to be readily changed when the cutting wheels require to be kept at more or leſs diſtance.

The iron bolt M. M. goes through two pieces of wood or iron P. P. 7 inches long, clear of the wood, ſupported by iron ſtays fixed to the frame, and through all the bulls. It requires to be ſtrong, as the draught of the horſes terminate there.

H. H. N° 2. and 3. a cylinder or ſegment of wood, 7 inches diameter, called a *rocking tree*, which goes acroſs the frame, and moves on the pivots fixed into it, one at each end, ſupported by an iron bolt or piece of wood mortiſed into the frame, 8 inches high, as appears in N° 2. and 3. to which 6 chains or ropes are fixed by hooks, at different diſtances, as you want your cuts, 9, 8, 7 or 6 inches from one another, and are joined to the end of each bull in which the cutting wheels run; ſo that when the rocking tree is turned about by the lever I, fixed in the middle of it, all the bulls, with their cutting wheels, are raiſed out of the ground at once, as in N° 3. by which means the machine may be turned, or moved from place to place with great eaſe, without any danger of ſtraining the wheels.

L. L. L. &c. N° 1. 2. 3. are weights of freeſtone, 26 inches long and 6 inches broad; the under one 4 inches thick, the upper one 3 inches thick; weighing about 64 ℔. the under, and 48 the upper; each of them having two holes, through which iron ſpikes, firmly fixed in the bulls, paſs, in order to keep them ſteady.

When the ground is eaſily cut, the under ſtone may anſwer; when more difficult, the other ſtone may be added; ſo that every wheel may have 7 ſtone-weight upon it, which has been found ſufficient for the ſtiffeſt land and tougheſt ſward the machine has ever been tried on. Caſt iron weights will anſwer fully better, but are more expenſive.

The level I. N° 2. 3. which ought to be 5 feet long, muſt have a ſliding rope on it; fixed to the back part of the frame; ſo that when the cutting wheels are all taken out of the ground three or four inches, by the rocking tree's being turned partly round by the lever, the rope may be fixed to it by a loop over the pin R. N° 3. (it ought to be placed 3 feet 4 inches from the extremity of the lever I.) Thus all the cutting wheels are kept out of the ground till the machine is turned; and then by moving the loop off the pin, it ſlips back towards the frame, and the lever is gently let back to its place, as in N° 2. by which the cutting wheels are put into their former poſture, by the weights fixed on the bulls in which they run. The levers may be made of good tough aſh.

P. P. N° 1.

P. P. N° 1. a ſmall bolt of iron, with a hook on one end of it (one is ſufficient), to ſtrengthen the bolt M. M. to be hooked on the centre of it, and joined to the frame by a nut and ſcrew.

The grooves in which the cutting wheels run, may be covered below at the hinder part with a plate of thin black iron, 6 inches long, 3 inches broad, having a ſlit in it where the wheels run, to prevent (if found neceſſary) any graſs, weeds, or ſmall ſtones, from filling the grooves, and clogging the wheels.

To the frame N° 1. are fixed (for a double-horſe ſward-cutter) three ſhafts, as in a waggon, of ſuch length, ſtrength, and diſtance from one another, as any workman may think proper.

For a ſingle-horſe ſward-cutter (which has only four cutting-wheels), a pair of ſhafts are uſed, and may make the two ſides of the frame without any joinings. The width of the frame, in proportion to the double-horſe ſward-cutter, is as four to ſix.

It is recommended for a double-horſe ſward-cutter to have eight bulls and wheels, in order that when it is uſed to reduce hard clody ſummer-fallow, or land for barley, before the laſt furrow, or even after it, the whole weight (42 ſtone) employed in cutting the ſtiffeſt land and tougheſt ſward, may be applied to the 8 bulls then at 6 inches from one another. The 64 ℔. weights to be applied to ſix of the bulls, and two of the 48 ℔. weights to each of the additional bulls, which is a ſufficient weight fot the purpoſe, and will effectually prevent a clod of more than ſix inches breadth from eſcaping being broke to pieces.

In the ſame manner, a ſingle-horſe ſward-cutter may have ſix bulls for the above-mentioned purpoſe; the 28 ſtone belonging to it divided thus: The 64 ℔. weights to four of the bulls, and two of the 48 ℔. weights to each of the additional bulls.

That the machine may come as cheap as poſſible to the public, the inventor is of opinion, that the expence of the two wheels and the iron axle (which is conſiderable) may be ſaved, by joining ſtrongly to the frame at S. N° 3. a piece of wood with a little curve at the extremity of it, reſembling the foot of a ſledge, formerly much uſed in Scotland to carry in the corn from the field; the part of it reſting on the ground being kept 18 inches (the half diameter of the wheels) from the frame, by a ſtrong ſupport of wood.

As the two outer bulls next the frame are apt to get under it, ſo as to prevent the cutting wheels from being taken out of the ground, a thin ſlip of iron fixed to the inſide of the frame, nearly oppoſite to the back end of the bulls, of convenient length, will be found neceſſary.

The original intention of this machine was to prepare old graſs-ground for the plough, by cutting it acroſs the ridges, in the beginning of or during winter, when the ground is ſoft, in order to anſwer all the purpoſes that Mr Tull propoſed by his four-coulter plough above deſcribed, and ſo ſtrongly recommended by him for bringing into tilth graſs-ground that has been long reſted. This the ſward-cutter has been found to do much more effectually and expeditiouſly: For Mr Tull's machine cuts the ſward in the ſame direction with the plough; and is liable, from every obſtruction any of the coulters meet with, to be thrown out of its work altogether, or the inſtrument broken: to which the ſward-cutter, conſiſting of four, ſix, or more cutting wheels, is never liable, from theſe being entirely independent of one another, cutting the ground acroſs the ridges before ploughing, and rendering that operation eaſier to two horſes than it would be to three, without its being cut. The furrow being cut acroſs, falls finely from the plough in ſquares of any ſize required not under ſix inches, in place of long ſlips of tough ſward ſeldom and imperfectly broke by the four-coultered plough.

This inſtrument is very fit for preparing ground for burnbating, as it will ſave much hand-labour.

It may be properly uſed in croſs-cutting clover of one or two years ſtanding, to prepare the ground for wheat, if the land is ſtiff and moiſt enough.

It may be applied to cutting and croſs-cutting paſture-ground, intended to have manure of any kind put upon it to meliorate the graſs. In this it will far exceed the ſcarificator mentioned in one of Mr Young's tours; as that inſtrument is liable, as well as the four-coultered plough, to be thrown out of its work when meeting with a ſtone or other interruption. This the ſward-cutter is proof againſt, which is looked on as its greateſt excellence.

In preparing for barley, the ſward-cutter excels a roller of any kind in reducing the large hard clods in clay-land, occaſioned by a ſudden drought, after its being ploughed too wet; and it is likewiſe very proper for reducing ſuch clay land when under a ſummer-fallow. In this operation, the ſward-cutter is greatly to be preferred to the cutting-roller, likewiſe mentioned by Mr Young in one of his tours; for the wheels of the latter being all dependent one on another, when one is thrown out by a ſtone, three or four muſt ſhare the ſame fate. Beſides, the cutting-roller has but ſeven wheels in ſix feet; whereas the ſward-cutter has ſix in four feet three inches, at nine inches diſtance; and, if neceſſary, may have them ſo near as ſix inches.

After old graſs-ground is cut acroſs with the ſward-cutter and ploughed, it has a very uncommon and worklike appearance, from each ſquare turned over by the plough being raiſed up an inch or two at the ſide laſt moved by the earth-board; ſo that the field, when finiſhed, is all prettily waved, and reſembles a piece of water when blown on by a gentle breeze. By this means a very great deal of the land's ſurface is expoſed to the froſt and other influences of the air, which cannot fail to have a good effect on it.

Two horſes are ſufficient for the draught of a double-horſe ſward-cutter, and one horſe for a ſingle-horſe one. One man manages the machine and drives the horſes. He begins his operation by firſt meaſuring off 20 or 30 paces from the machine, leſs or more as he inclines, and there fixes a pole. He then cuts the field croſs, as near at right angles with the ridges as he can. When the cutting wheels are paſt the laſt furrow about a yard or ſo, and the machine is upon the utmoſt ridge of the field on which it muſt turn, he muſt ſtop the horſes; then take hold of the lever I. N° 2. and by pulling it to him he raiſes the cutting wheels out of the ground, which are kept ſo by the loop of the rope being put over the pin R. in the lever I. N° 3. till the machine is turned and brought to its proper place, which is done by meaſuring off the ſame diſtance formerly done on the oppoſite ſide of the field. When the cutting wheels are exactly over the utmoſt furrow, then, on the horſes being ſtopped, the rope is ſlipt off the pin R. and the lever returned to its former place, as repreſented N° 2. which allows the weights L.L. &c. to force the cutting wheels into the ground again. He then goes on till the interval betwixt the firſt and ſecond ſtroke of the machine is all cut. In this manner the field is to be finiſhed, after which you may begin to plough when you pleaſe. (N. B. There muſt be a pole at each ſide of the field.)

It is of no conſequence whether the land to be ſward-cut is in crooked ridges or ſtraight, in flat ridges or in very high raiſed ones. Be the ſurface ever ſo uneven, the cutting wheels, being all independent of one another, are forced by their weights into every furrow or hollow.

One ſward-cutter will cut as much in one day, as ſix ploughs will plough.

The land may lie ſeveral months in winter after being ſward-cut, when there is no vegetation to make the cuts grow together again before it is ploughed; but the ſooner it is ploughed after cutting the better, that it may have the benefit of all the winter's froſt, which makes it harrow better in ſeed-time.

When the ground is harrowed, the harrows ought to go with the waves which appear after ploughing, not againſt them, as by that means they are leſs apt to tear up the furrows all cut into ſquares. This, however, need only be attended to the two firſt times of harrowing, as they are called.

Any common wright and ſmith may make the inſtrument. It is very ſtrong, very ſimple, and eaſily managed and moved from place to place; and, if put under cover, will laſt many years.

It was invented ſome time ago by the Honorable Robert Sandilands; and is repreſented in the Plate as it has been lately improved by him, the price being at the ſame time reduced from L. 15 or L. 16 to L. 5 or L. 6.

3. The BRAKE.

96 Brake deſcribed, Plate VI. fig. 2.

The brake is a large and weighty harrow, the purpoſe of which is to reduce a ſtubborn ſoil, where an ordinary harrow makes little impreſſion. It conſiſts of four ſquare bulls, each ſide five inches, and ſix feet and a half in length. The teeth are 17 inches long, bending forward like a coulter. Four of them are inſerted into each bull, fixed above with a ſcrew-nut, having 12 inches free below, with a heel cloſe to the under part of the bull, to prevent it from being puſhed back by ſtones. The nut above makes it eaſy to be taken out for ſharping. This brake requires four horſes or four oxen. One of a leſſer ſize will not fully anſwer the purpoſe: one of a larger ſize will require ſix oxen; in which caſe the work may be performed at leſs expence with the plough.

97 Uſes.

This inſtrument may be applied to great advantage in the following circumſtances. In the fallowing ſtrong clay that requires frequent ploughings, a breaking between every ploughing will pulverize the ſoil, and render the ſubſequent ploughings more eaſy. In the month of March or April, when ſtrong ground is ploughed for barley, eſpecially if bound with couch-graſs, a croſs-breaking is preferable to a croſs-ploughing, and is done at half the expence. When ground is ploughed from the ſtate of nature, and after a competent time is croſs-ploughed, the brake is applied with great ſucceſs, immediately after the croſs-ploughing, to reduce the whole to proper tilth.

Let it be obſerved, that a brake with a greater number of teeth than above-mentioned, is improper for ground that is bound together by the roots of plants, which is always the caſe of ground new broken up from its natural ſtate. The brake is ſoon choked, and can do no execution till freed from the earth it holds. A leſs number of teeth would be deficient in pulverizing the ſoil.

4. The HARROW.

HARROWS are commonly conſidered as of no uſe but to cover the ſeed; but they have another uſe ſcarce leſs eſſential, which is to prepare land for the ſeed. This is an article of importance for producing a good crop. But how imperfectly either of theſe purpoſes is performed by the common harrow, will appear from the following account of it.

98 Imperfection of the common harrow.

The harrow commonly uſed is of different forms. The firſt we will mention has two bulls, four feet long and 18 inches aſunder, with four wooden teeth in each. A ſecond has three bulls and 12 wooden teeth. A third has four bulls, and 20 teeth of wood or iron, 10, 11, or 12 inches aſunder. Now, in fine mould, the laſt may be ſufficient for covering the ſeed; but none of them are ſufficient to prepare for the ſeed any ground that requires ſubduing. The only tolerable form is that with iron teeth; and the bare deſcription of its imperfections will ſhow the neceſſity of a more perfect form. In the firſt place, this harrow is by far too light for ground new taken up from the ſtate of nature, for clays hardened with ſpring-drought, or for other ſtubborn ſoils: it floats on the ſurface; and after frequent returns in the ſame tract, nothing is done effectually. In the next place, the teeth are too thick ſet, by which the harrow is apt to be choked, eſpecially where the earth is bound with roots, which is commonly the caſe. At the ſame time, the lightneſs and number of teeth keep the harrow upon the ſurface, and prevent one of its capital purpoſes, that of dividing the ſoil. Nor will fewer teeth anſwer for covering the ſeed properly. In the third place, the teeth are too ſhort for reducing a coarſe ſoil to proper tilth; and yet it would be in vain to make them longer, becauſe the harrow is too light for going deep into the ground. Further, the common harrows are ſo ill conſtructed, as to ride at every turn one upon another. Much time is loſt in diſengaging them. Laſtly, it is equally unfit for extirpating weeds. The ground is frequently ſo bound with couch-graſs, as to make the furrow-ſlice ſtand upright, as when old lea is ploughed: notwithſtanding much labour, the graſs-roots keep the field, and gain the victory.

A little reflection, even without experience, will make it evident, that the ſame harrows, whatever be the form, can never anſwer all the different purpoſes of harrowing, nor can operate equally in different ſoils, rough or ſmooth, firm or looſe. The following, therefore, have been recommended; which are of three different

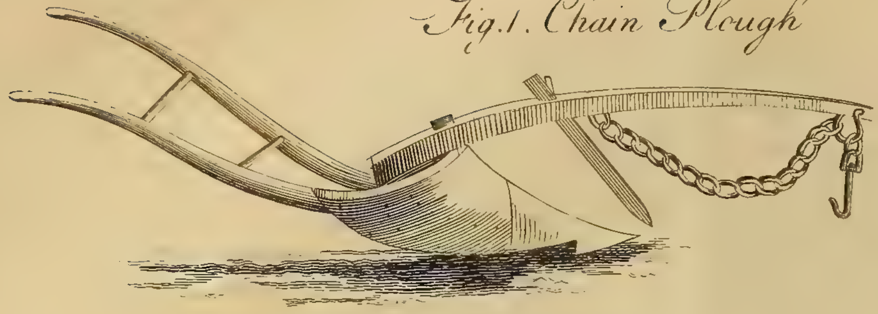


Fig. 1. Chain Plough

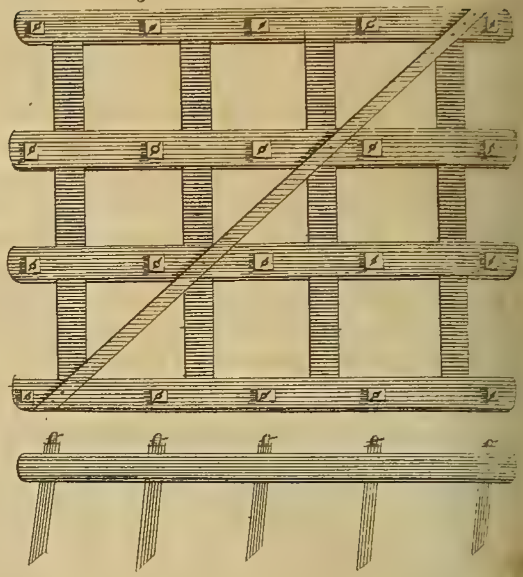


Fig. 3. first Harrow

Fig. 2. Brake

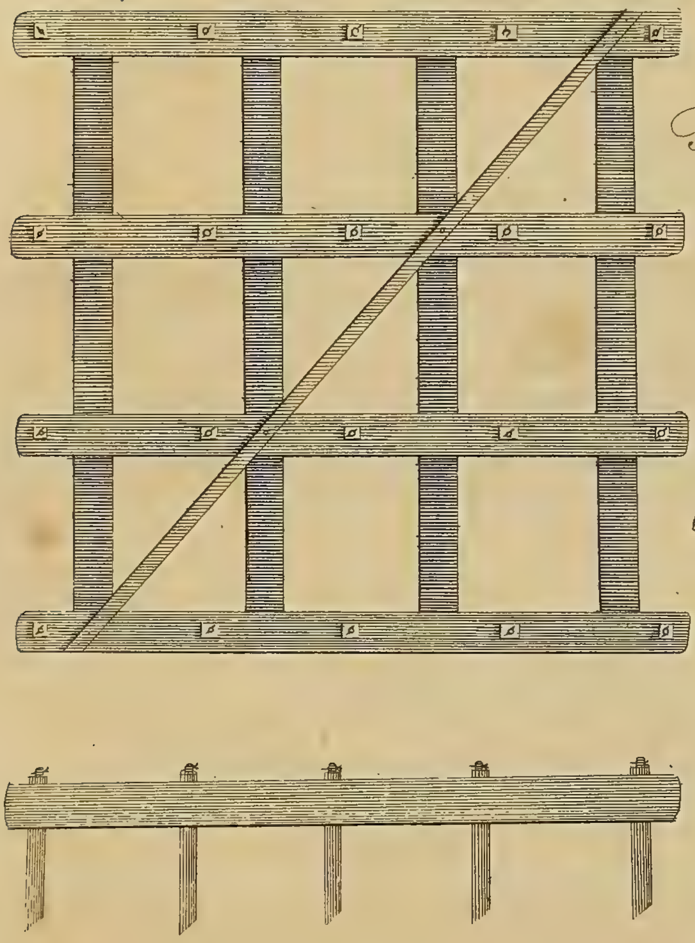


Fig. 8. Chain & Screw Harrow

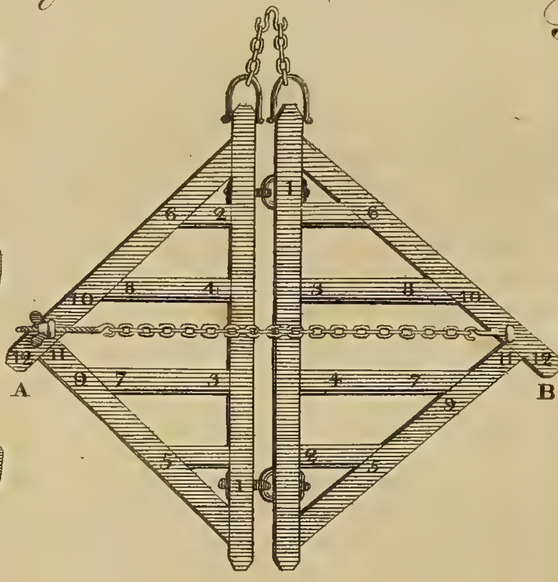


Fig. 4. second Harrow

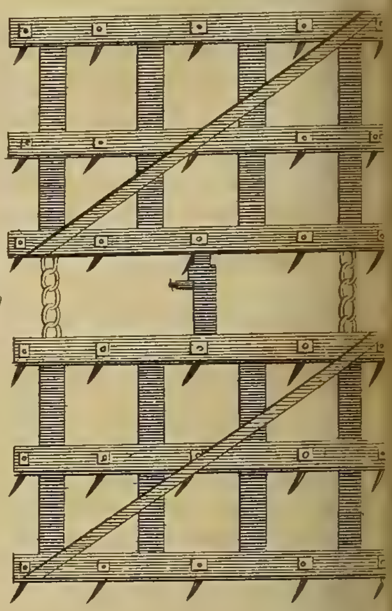


Fig 5. third Harrow

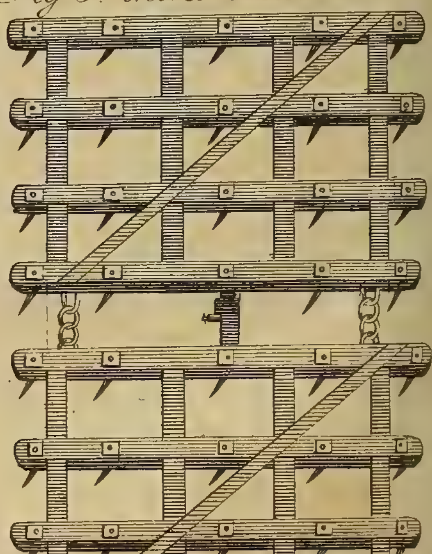


Fig. 6. Cleaning Harrow

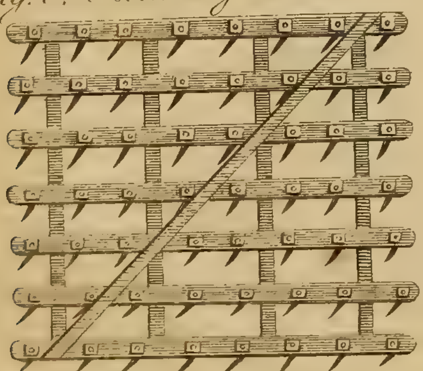
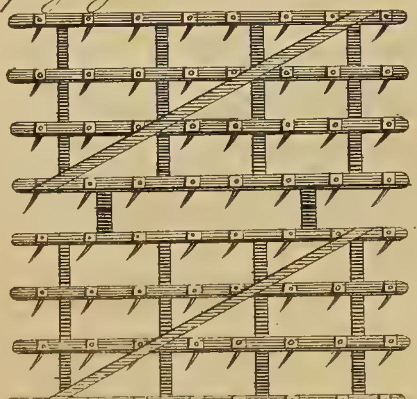


Fig 7 Graſs Seed Harrow



Scot Philad^a

99 Improved harrows. Plate VI. fig. 3. ferent forms, adapted for different purpoſes. They are all of the ſame weight, drawn each by two horſes. Birch is the beſt wood for them, becauſe it is cheap, and not apt to ſplit. The firſt is compoſed of four bulls, each four feet ten inches long, three and a quarter inches broad, and three and a half deep; the interval between the bulls 11 and three-fourths inches; ſo that the breadth of the whole harrow is four feet. The bulls are connected by four ſheths, which go thro' each bull and are fixed by timber-nails driven through both. In each bull five teeth are inſerted, ten inches free under the bull, and ten inches aſunder. They are of the ſame form of thoſe with the brake, and inſerted into the wood in the ſame manner. Each of theſe teeth is three pounds weight; and where the harrow is made of birch, the weight of the whole is ſix ſtone 14 pounds, Dutch. An erect bridle is fixed at the corner of the harrow three inches high, with four notches for drawing higher or lower. To this bridle a double tree is fixed for two horſes drawing abreaſt, as in a plough. And to ſtrengthen the harrow, a flat rod of iron is nailed upon the harrow from corner to corner in the line of the draught.

Fig. 4. The ſecond harrow conſiſts of two parts, connected together by a crank or hinge in the middle, and two chains of equal length, one at each end, which keep the two parts always parallel, and at the ſame diſtance from each other. The crank is ſo contrived as to allow the two parts to ply to the ground like two unconnected harrows; but neither of them to riſe above the other, more than if they were a ſingle harrow without a joint. In a word, they may form an angle downward but not upward. Thus they have the effect of two harrows in curved ground, and of one weighty harrow in a plain. This harrow is compoſed of ſix bulls, each four feet long, three inches broad, and three and a half deep. The interval between the bulls nine and a half inches; which makes the breadth of the whole harrow, including the length of the crank, to be five feet five inches. Each bull has five teeth, nine inches free under the wood, and ten inches aſunder. The weight of each tooth is two pounds; the reſt as in the former.

Fig. 5. The third conſiſts alſo of two parts, connected together like that laſt mentioned. It has eight bulls, each four feet long, two and a half inches broad, and three deep. The interval between the bulls is eight inches; and the breadth of the whole harrow, including the length of the crank, is ſix feet four inches. In each bull are inſerted five teeth, ſeven inches free under the wood, and ten and a half inches aſunder, each tooth weighing one pound. The reſt as in the two former harrows.

200 Properties of theſe harrows. Theſe harrows are a conſiderable improvement. They ply to curved ground like two unconnected harrows; and when drawn in one plain, they are in effect one harrow of double weight, which make the teeth pierce deep into the ground. The imperfection of common harrows, mentioned above, will ſuggeſt the advantages of the ſet of harrows here recommended. The firſt is proper for harrowing land that has long lain after ploughing, as where oats are ſown on a winter-furrow, and in general for harrowing ſtiff land: it pierces deep into the ſoil by its long teeth, and divides it minutely. The ſecond is intended for covering the ſeed: its long teeth lays the ſeed deeper than the common harrow can do; which is no ſlight advantage. By placing the ſeed conſiderably under the ſurface, the young plants are, on the one hand, protected from too much heat, and, on the other, have ſufficiency of moiſture. At the ſame time, the ſeed is ſo well covered that none of it is loſt. Seed ſlightly covered by the common harrows wants moiſture, and is burnt up by the ſun; beſide, that a proportion of it is left upon the ſurface uncovered. The third harrow ſupplies what may be deficient in the ſecond, by ſmoothing the ſurface, and covering the ſeed more accurately. The three harrows make the ground finer and finer, as heckles do lint; or to uſe a different compariſon, the firſt harrow makes the bed, the ſecond lays the ſeed in it, the third ſmooths the cloaths. They have another advantage not inferior to any mentioned: they mix manure with the ſoil more intimately than can be done by common harrows; and upon ſuch intimate mixture depends greatly the effect of manure, as has already been explained. To conclude, theſe harrows are contrived to anſwer an eſtabliſhed principle in agriculture, That fertility depends greatly on pulverizing the ſoil, and on an intimate mixture of manure with it, whether dung, lime, marle, or any other.

Plate VI. *The Chain and Screw Harrow.* Fig. 8. is the plan of a harrow alſo invented by Mr Sandilands, and to which he has given the name of the *chain and ſcrew harrow.* Its properties are, that if your ridges be high, and you wiſh to harrow them from one end to the other, by lengthening the chain (which the ſcrew commands), the harrow, when drawn along, forms an angle downwards, and miſſes none of the curve of the ridge, ſo far as it extends (which may be nine feet, the diſtance from A to B. The extent in the contrary direction, is five feet ſix inches). When the crowns of the ridges have got what is thought ſufficient harrowing lengthwiſe, you ſhorten the chain by the ſcrew, which forms an angle upwards: the harrow is then drawn by the horſes, one on each ſide of the furrow; which completely harrows it, and the ſides of the ridge, if 18 feet broad.

When you want to harrow even ground or high ridges acroſs with the ſcrew, you can bring the harrow to be horizontal, ſo as to work as a ſolid harrow without a joint.

The teeth are formed and fixed in the common manner, ſquare, not in the faſhion of coulters; and are nine or ten inches below the wood, and of ſuch ſtrength as it is thought the land requires. The teeth cut, or rather tear, the ground at every four inches without variation, though ſeeemingly placed irregular; and this without any riſk of choking, except ſometimes at the extreme angles, where the teeth are neceſſarily near each other; but which may be cleaned with the greateſt eaſe, by raiſing them a little from the ground. The figures 1, 2, &c. point out where the 12 teeth on each ſide of the harrow are placed.

Where a ſtrong brake-harrow is not neceſſary, by making the teeth ſhorter and lighter, you may have 48 teeth, which will tear the ground at every two inches, cover the ſeed well, and make a fine mould.

It is recommended, that harrows for every purpoſe, and of any ſize, be made on the above principle; by which no tooth can ever follow the track of another, and all of them will be kept conſtantly acting.

5. The Roller.

101 The roller. THE roller is an inſtrument of capital uſe in huſbandry, though ſcarcely known in ordinary practice; and, where introduced, it is commonly ſo ſlight as to have very little effect.

Rollers are of different kinds; ſtone, caſt-iron, wood. Each of theſe has its advantages. We would recommend the laſt, conſtructed in the following manner. Take the body of a tree, ſix feet ten inches long, the larger the better, made as near a perfect cylinder as poſſible. Surround this cylinder with three rows of fillies, one row in the middle, and one at each end. Line theſe fillies with planks of wood equally long with the roller, and ſo narrow as to ply into a circle. Bind them faſt together with iron rings. Beech-wood is the beſt, being hard and tough. The roller thus mounted ought to have a diameter of three feet ten inches. It has a double pair of ſhafts for two horſes abreaſt. Theſe are ſufficient in level ground; in ground not level, four horſes may be neceſſary. The roller without the ſhafts ought to weigh 200 ſtone Dutch; and the large diameter makes this great weight eaſy to be drawn.

102 Seaſon for rolling. Rolling wheat in the month of April is an important article in looſe ſoil; as the winter-rains preſſing down the ſoil leave many roots in the air. Barley ought to be rolled immediately after the ſeed is ſown; eſpecially where graſs ſeeds are ſown with it. The beſt time for rolling a gravelly ſoil, is as ſoon as the mould is ſo dry as to bear the roller without clinging to it. A clay ſoil ought neither to be tilled, harrowed, nor rolled, till the field be perfectly dry. And as rolling a clay ſoil is chiefly intended for ſmoothing the ſurface, a dry ſeaſon may be patiently waited for, even till the crop be three inches high. There is the greater reaſon for this precaution, becauſe much rain immediately after rolling is apt to cake the ſurface when drought follows. Oats in a light ſoil may be rolled immediately after the ſeed is ſown, unleſs the ground be ſo wet as to cling to the roller. In a clay ſoil, delay rolling till the grain be above ground. The proper time for ſowing graſs-ſeeds in an oat-field, is when the grain is three inches high; and rolling ſhould immediately ſucceed, whatever the ſoil be. Flax ought to be rolled immediately after ſowing. This ſhould never be neglected; for it makes the ſeed puſh equally, and prevents after-growth: the bad effect of which is viſible in every ſtep of the proceſs for dreſſing flax. The firſt year's crop of ſown graſſes ought to be rolled as early the next ſpring as the ground will bear the horſes. It fixes all the roots preciſely as in the caſe of wheat. Rolling the ſecond and third crops in looſe ſoil is an uſeful work; though not ſo eſſential as rolling the firſt crop.

103 Effects of rolling. In the firſt place, rolling renders a looſe ſoil more compact and ſolid; which encourages the growth of plants, by making the earth clap cloſe to every part of every root. Nor need we be afraid of rendering the ſoil too compact; for no roller that can be drawn by two or four horſes will have that effect. In the next place, rolling keeps in the moiſture, and hinders drought to penetrate. This effect is of great moment. In a dry ſeaſon, it may make the difference of a good crop, or no crop, eſpecially where the ſoil is light. In the third place, the rolling graſs ſeeds, beſide the foregoing advantages, facilitates the mowing for hay; and it is to be hoped, that the advantage of this practice will lead farmers to mow their corn alſo, which will increaſe the quantity of ſtraw both for food and for the dunghill.

There is a ſmall roller for breaking clods in land intended for barley. The common way is, to break clods with a mell; which requires many hands, and is a laborious work. This roller performs the work more effectually, and at much leſs expence: let a harrowing precede, which will break the clods a little; and after lying a day, or a day and a half, to dry, this roller will diſſolve them into powder. This however does not ſuperſede the uſe of the great roller after all the other articles are finiſhed, in order to make the ſoil compact, and to keep out the ſummer-drought. A ſtone roller four feet long, and fifteen inches diameter, drawn by one horſe, is ſufficient to break clods that are eaſily diſſolved by preſſure. The uſe of this roller in preparing land for barley is gaining ground daily, even among ordinary tenants, who have become ſenſible both of the expence and toil of uſing wooden mells. But in a clay ſoil, the clods are ſometimes too firm, or too tough, to be ſubdued by ſo light a machine. In that caſe, a roller of the ſame ſize, but of a different conſtruction, is neceſſary. It ought to be ſurrounded with circles of iron, ſix inches aſunder, and ſeven inches deep; which will cut even the moſt ſtubborn clods, and reduce them to powder. Let not this inſtrument be conſidered as a finical refinement. In a ſtiff clay, it may make the difference of a plentiful or ſcanty crop.

6. The Fallow-cleansing Machine.

104 The fallow-cleanſing machine, Plate VII. fig. 5. THIS was invented by Mr Aaron Ogden, a ſmith at Aſhton-under-Line, near Mancheſter in Lancaſhire. It is intended for cleanſing fallows from weeds, &c. which exhauſt the riches of the ſoil. A, A, is the frame; B, the firſt roller; C, the ſecond ditto; in which laſt are two cranks to move the arms D, D, which work the rake up the directors fixed on the plank E. The under ſide of the lower ends or ſhares of theſe directors are ſharp, to cut the clods and let them come on the upper ſide. Each alternate heel of the ſhare is longer than the intermediate one, that they may not have more than one-half to cut at once. At the back of the plank E are two ſcrews to let it looſe, that the directors may be ſet higher or lower. The ſhares are to penetrate the ground two or three inches, to raiſe the quicks till the rake I, I, fetches them into the cart H, where a man muſt be ready with a muck-hook to clear them backward when gathered. In the rake I are two teeth for every ſpace of the directors, that ſtones, &c. may be gathered without damage. K, K, are two ſtaples, by which the machine is drawn: under them at *h* are two hooks, placed low to raiſe the machine in turning, by the help of the traces; and the axle-tree of the cart ſhould be fixed upon a pin, that it may turn like a waggon. F, F, are the triggers to throw the rake behind the roots. The long teeth at G, G, are to cleanſe the roller C. I, I, is the rake which gathers up the weeds

into the cart H, and is drawn above the trigger F by the working of the arms D, expreſſed by the dotted lines at *d d*, *i i i*. The triggers F, of which there is one on each ſide, move on the pivots *a* ; ſo that when the points *b*, of the rake I, have been drawn up by the directors E to the part marked *c*, the trigger, giving way, permits the rake to paſs ; but immediately falling, the rake returns along the upper ſurface of the trigger marked *e*, *e*, and of courſe falls on the weeds when it comes to the end, a little beyond the pivot *a*. The reader will obſerve, that the boarding is taken away on one ſide, in the Plate, in order to give a more perfect view of the inner parts of the machine ; and in fact it would perhaps be better if all the boarding, marked L, L, L, was taken away, and frame-work put in its ſtead. The cart H might undoubtedly alſo be made lighter. The wheels M, M, appear in the Plate to be made of ſolid wood ; but there is no neceſſity they ſhould be ſo. At N is another view of the roller C, by which the diſpoſition of the ſpikes may be eaſily comprehended. Suppoſe the circle O, deſcribed by the end of the roller N, to be divided by four ſtraight lines into eight equal ſegments, as repreſented at P. Let the ſame be done at the other end of the roller, and parallel lines be drawn from one correſponding point to the other the length of the roller ; mark the points with figures 1, 2, 3, 4, 5, 6, 7, 8 ; afterwards draw oblique lines, as from 1, at the end of O, to 2, at the other end, and from 2 to 3, &c. On theſe oblique lines the ſpikes are to be fixed at equal diſtances, in eight circles, deſcribed on the circumference of the roller. The ſpikes of the ſmall roller B are fixed in the ſame manner, except that the diameter being ſmaller, there are only ſix inſtead of eight rows. R is another view of the directors, with the plank E on which they are fixed ; and S is a ſection of a part of the plank, with one of the directors as fixed, in which may be ſeen the heel *m*, from whence to the point of the ſhare *n* is a ſharp cutting edge. See the ſame letters in figure R. At T is one of the long teeth to be ſeen at G ; it is bent towards the roller C, which it ſerves to cleanſe. When the end of the rake *b*, after riſing above *c*, is puſhed, by the motion of the arms D, D, along the upper part *e*, of the trigger F, and comes to the end beyond *a* ; as it falls, the part of the arm marked *o* reſts in the notch *p*, till it is again raiſed by the motion of the roller C with the rake. The roller C is to be one foot diameter, the ſpikes nine inches long, that they may go through the furrow (if the ſoil ſhould be looſe) into the hard earth, the more effectually to work the rake, which otherwiſe might be ſo overcharged as to cauſe the roller to drag without turning. In the rake-ends *b* there ſhould be pivots, with rollers or pullers on, to go in the groove, to take off the friction ; and they would likewiſe take the triggers more ſurely as the rake comes back. The rake ſhould alſo be hung ſo far backward, that when it is fallen the arms of it may lie in the ſame plane or parallel with the directors, on which it comes up (which will require the frame to be two inches longer in the model). This will cauſe the rake to fall heavier, and drive the teeth into the roots, and bring them up without ſhattering. Theſe teeth muſt be made of ſteel, very fine, and ſo long as to reach down to the plank on which the directors are fixed, that is to ſay, ſix inches long (the directors are alſo to be made ſix inches broad above the plank). The rake-head ſhould alſo fall a little before the crank is at its extremity, which will cauſe the rake to puſh forward to let the teeth come into the roots. The rake-teeth muſt drop in the ſame plane with the roller and wheels, or on the ſurface of the earth. No more ſpace ſhould be given from the roller C to the long teeth at G G than that the rake may juſt miſs the ſpikes of the roller C, and fall on the places before mentioned. As the firſt roller B was intended to cleanſe the ſecond C more than for any other uſe, it may be omitted when the machine is made in large, as Mr Ogden has lately found that the long teeth at G G anſwer the end alone, and this renders the machine about a ſixth part ſhorter. Now, to ſuit any ſort of earth, there ſhould be to each machine three planks, with directors at different ſpaces, to uſe occaſionally ; in the firſt the ſpaces between the directors ſhould be eight inches wide, in the ſecond ſix, and the third four. This will anſwer the ſame end as having ſo many machines.

As there may be ſome objections to the rake not leaving the roots when it has brought them up, Mr Ogden has ſeveral methods of cleanſing it ; but as he would make it as ſimple as poſſible, he chooſes to let it be without them at preſent ; but ſuppoſe it ſhould bring ſome roots back again with it, it will probably loſe them before it gets back to the extremity ; whence they will lie light, and be of but little detriment to the others coming up. Mr Ogden would have the firſt machine made four feet ſix inches wide, the teeth divided into equal ſpaces, the outſides into half ſpaces.

7. The new-invented Patent Univerſal Sowing *Machine*.

105 Univerſal ſowing machine, Plate IX. fig. 1. 2. 11.

This machine, whether made to be worked by hand, drawn by a horſe, or fixed to a plough, and uſed with it, is extremely ſimple in the conſtruction, and not liable to be put out of order ; as there is but one movement to direct the whole, nor does it require any ſkill in working. It will ſow wheat, barley, oats, rye, clover, cole-ſeed, hemp, flax, canary, rape, turnip, beſides a great variety of other kinds of grain and ſeeds broad-caſt, with an accuracy hitherto unknown. It is equally uſeful in the new huſbandry, particularly when fixed to a plough ; it will then drill a more extenſive variety of grain, pulſe, and ſeed, (through every gradation, with regard to quantity), and deliver each kind with greater regularity, than any drill-plough whatever. When uſed in this manner, it will likewiſe be found of the utmoſt ſervice to farmers who are partial to the old huſbandry, as, among many other very valuable and peculiar properties, it will not only ſow in the broad-caſt way with a moſt ſingular exactneſs, but ſave the expence of a ſeedſman ; the ſeed being ſown (either over or under furrow at pleaſure), and the land ploughed, at the ſame operation.

Perhaps a fair and deciſive experiment for aſcertaining the ſuperior advantage of broad-caſting or drilling any particular crop, was never before ſo practicable ; as the ſeed may now be put in with the utmoſt degree of regularity, in both methods of culture, by the ſame machine: conſequently, the ſeed will be ſown in both caſes with equal accuracy, without which it is impoſſible to make a juſt deciſion.

The excellence of this machine conſiſts in ſpreading any given quantity of ſeed over any given number of acres, with a mathematical exactneſs, which cannot be done by hand; by which a great ſaving may be made in ſeeding the ground, as well as benefiting the expected crop.

There has always been a difficulty in ſowing turnip ſeed with any degree of exactneſs, both from the minuteneſs of the ſeed, and the ſmallneſs of the quantity required to be ſown on an acre. Here the machine has a manifeſt advantage, as it may be ſet to ſow the leaſt quantity ever required on an acre; and with an accuracy the beſt ſeedſman can never attain to.

It will alſo ſow clover, cole, flax, and every other kind of ſmall ſeed, with the utmoſt degree of regularity.

It will likewiſe broad-caſt beans, peaſe, and tares, or drill them with the greateſt exactneſs, particularly when conſtructed to be uſed with a plough.

Another advantage attending the uſe of this machine is, that the wind can have no effect on the falling of the ſeed.

Fig. 2.

Of the Machine when made to be uſed without a Plough, and to be drawn by a Horſe.—It may in this caſe be made of different lengths, at the deſire of the purchaſer. The upper part AAAA, contains the hoppers from which the grain or ſeed deſcends into the ſpouts. The ſeveral ſpouts all reſt upon a bar, which hangs and plays freely by two diagonal ſupporters BB; a trigger fixed to this bar bears a catch-wheel: this being fixed on the axle, occaſions a regular and continual motion, or jogging of the ſpouts, quicker or ſlower in proportion to the pace the perſon ſowing with it drives; and of courſe, if he quickens his pace, the bar will receive a greater number of ſtrokes from the catch-wheel, and the grain or ſeed will feed the faſter. If he drives ſlower, by receiving fewer ſtrokes, the contrary muſt take place. In going along the ſide of a hill the ſtrength of the ſtroke is corrected by a ſpring which acts with more or leſs power, in proportion as the machine is more or leſs from a horizontal poſition, and counteracts the difference of gravity in the bar, ſo that it preſſes, in all ſituations, with a proper force againſt the catch-wheel. This ſpring is unneceſſary if the land be pretty level. At the bottom of the machine is placed an apron or ſhelf in a ſloping poſition, and the corn or ſeed, by falling thereon from the ſpouts above, is ſcattered about in every direction under the machine, and covers the ground in a moſt regular and uniform manner.

To ſow the corn or ſeed in drills, there are moveable ſpouts, (ſee fig. 10.) which are fixed on, or taken off at pleaſure, to direct the ſeed from the upper ſpout to the bottom of the furrow.

The machine is regulated for ſowing any particular quantity of ſeed on an acre by a braſs ſlider, A, fig. 7. fixed by ſcrews againſt a braſs bridge on each of the ſpouts. The machine is prevented from feeding while turning at the ends, by only removing the lever E, fig. 2. out of the channel G, to another at H, on the right hand of it, which carries back the bar from the catch-wheel, and occaſions the motion of the ſpouts to ceaſe, and at the ſame time brings them upon a level by the action of the diagonal ſupporters; ſo that no corn or ſeed can fall from them.

The machine in this form is particularly uſeful for broad-caſting clover upon barley or wheat; or for ſowing any other kind of ſeed, where it is neceſſary that the land ſhould firſt be harrowed exceedingly fine and even.

Manner of uſing the Machine, when drawn by a Horſe.—Place the machine about two feet from the ends of the furrows where you intend it ſhall begin to ſow. Fill the hoppers with ſeed, and drive it forwards with the outſide wheel in the firſt furrow. When you are at the end of the length, at the oppoſite ſide of the field, lift the lever E, fig. 2, into the channel H, and the machine will inſtantly ſtop ſowing. Drive it on about two feet, and then turn. Fill the hoppers again if neceſſary; then remove the lever back again into the channel, G, and in returning, let the outſide wheel of the machine go one furrow within the track which was made by it, in paſſing from the oppoſite end; as, for example, if the wheel paſſed down the eighth furrow from the outſide of the field, let it return in the ſeventh; and in every following length let the outſide wheel always run one furrow within the tract made by the ſame wheel: becauſe the breadth ſown is about nine inches leſs than the diſtance between the wheels.

Let the machine be kept in a perpendicular ſituation. If the farmer wiſhes to ſow more or leſs ſeed on any one part of the field than the other, it is only raiſing the handles a little higher, or ſinking them a little lower than uſual, and it will occaſion a ſufficient alteration; and ſhould the laſt turn be leſs in breadth than the machine, thoſe ſpouts which are not wanted may be taken up from the bar, and prevented from feeding, by turning the knob above them.

Alſo, when the land required to be ſown has what is called a *vent*, that is, when the ſides of the field run in an oblique line to the furrows, which by this means are unequal in length; the ſpouts muſt be taken up or let down in ſucceſſion by turning the knobs; as that part of the machine, where they are placed, arrives at the ends of the furrows. This is done while the machine is going forwards.

If the land be tolerably level, the machine may be fixed by the ſcrew in the front, and the machine may then be uſed by any common harrow boy.

Method of regulating the Machine.—In each ſpout is fixed a bridge, (ſee fig. 7.) with an aperture in it, B, for the grain or ſeed to paſs through. This aperture is enlarged or contracted by a ſlider, A, which paſſes over it; and when properly fixed for the quantity of ſeed deſigned to be ſown on an acre, is faſtened by means of two ſtrong ſcrews firmly againſt the bridge. This is made uſe of in ſowing all kinds of ſeed, where it is required to ſow from one buſhel upwards on an acre. To ſow one, two, three gallons, or any of the intermediate quantities, as of clover, cole-ſeed, &c. the braſs plate, fig. 6, is placed between the bridge and the ſlider, with the largeſt aperture B downwards, which aperture is enlarged or contracted by the ſlider as before.—To ſow turnips, the ſame plate is placed between the bridge and the ſlider, with its ſmalleſt aperture A downwards, and the hollow part about the ſame aperture inwards.

Fig. 8. is a view of the regulator, by which the apertures

AGRICULTURE.

Plate VII.

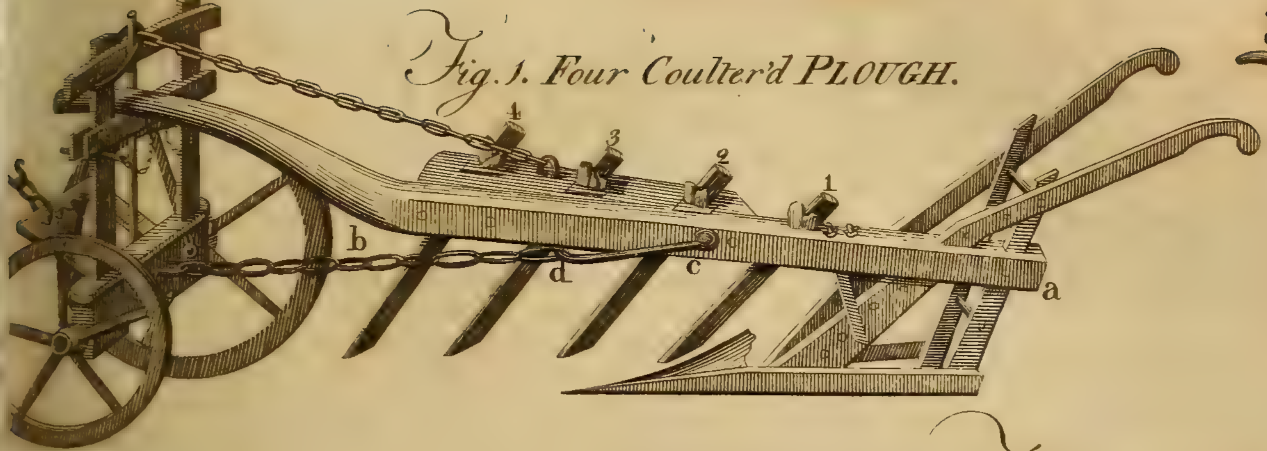


Fig. 1. Four Coulter'd PLOUGH.

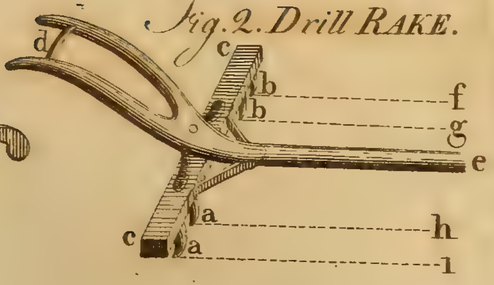


Fig. 2. Drill RAKE.

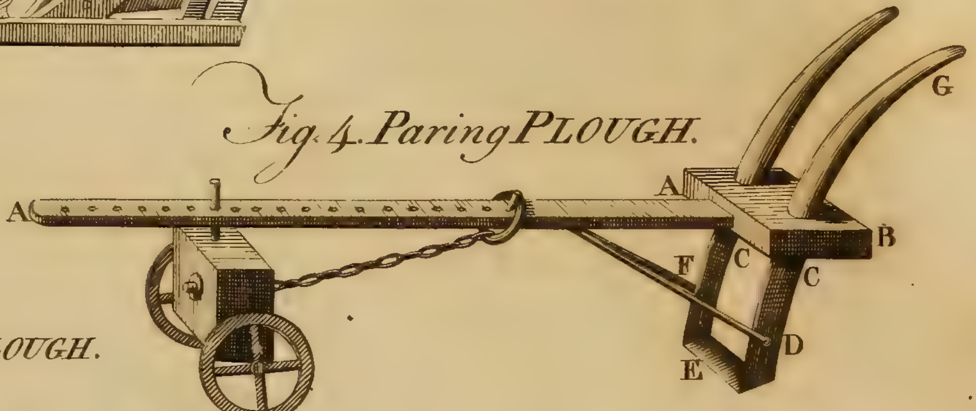


Fig. 4. Paring PLOUGH.

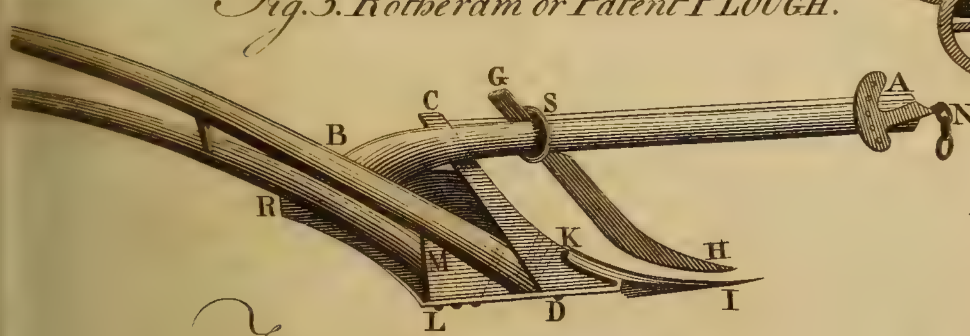


Fig. 3. Rotheram or Patent PLOUGH.

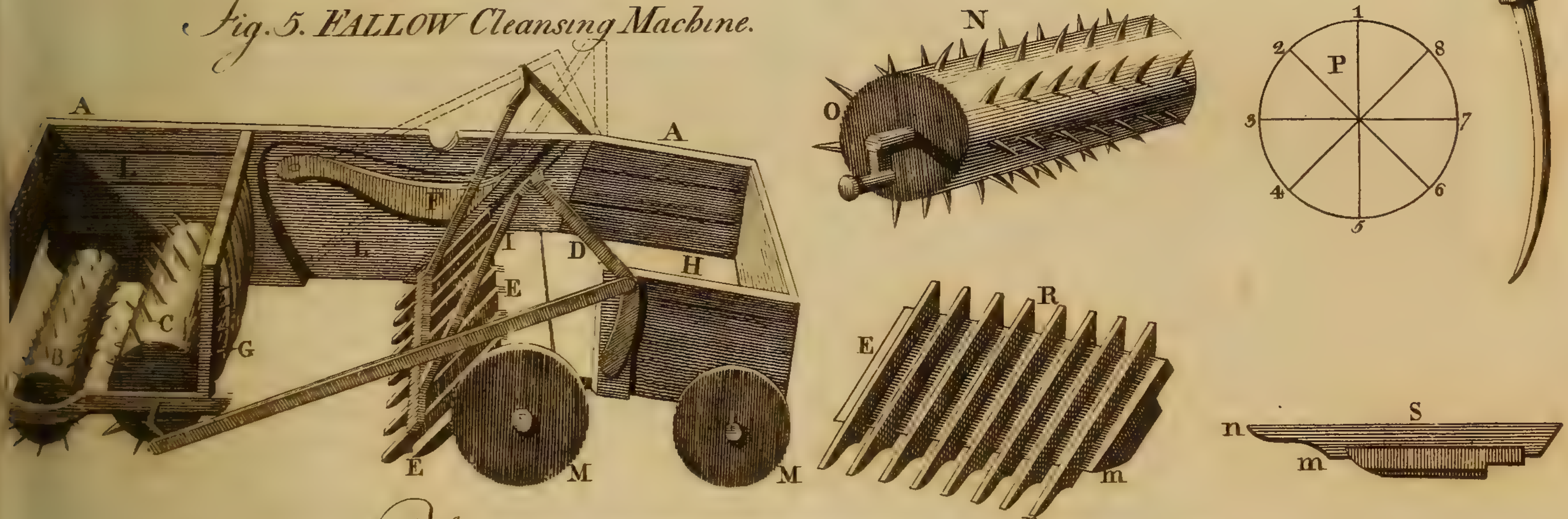


Fig. 5. FALLOW Cleansing Machine.

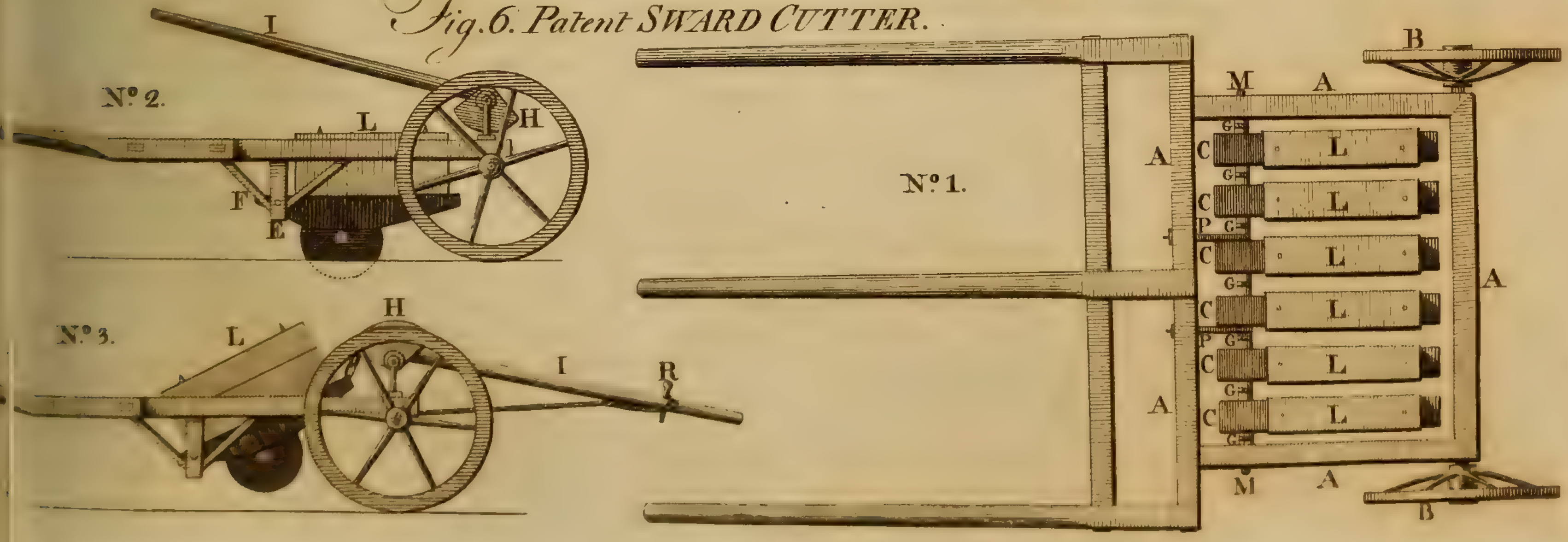


Fig. 6. Patent SWARD CUTTER.

apertures in the ſeveral ſpouts are all ſet exactly alike, with the utmoſt eaſe, to make them feed equally. The extreme height of the largeſt aperture is equal to the breadth A B, and the breadth at C is equal to the height of the ſmalleſt aperture uſed, viz. that for turnips. The ſide AC, is divided into 60 equal parts, and on it moves the ſlider or horſe D; which being placed at any particular degree, according to the quantity of ſeed required to be ſown on an acre, is fixed upon it, by a ſcrew on the ſide of the ſlider or horſe. When this is done, the end of the regulator is put through the aperture in the bridge or plate (whichever is intended to be uſed), and the ſlider againſt the bridge in the ſpout, raiſed by it, till it ſtops againſt the horſe on the regulator; then the ſlider is faſtened againſt the bridge firmly by the two ſcrews; care being taken at the ſame time that it ſtands nearly ſquare. By this means the ſpouts (being all fixed in the ſame manner) will feed equally.

It is eaſy to conceive that the ſize of the apertures, and conſequently the quantity of ſeed to be ſown on an acre, may be regulated with a far greater accuracy than is required in common practice.

The ſpouts may be regulated with the utmoſt nicety, in five minutes, to ſow each particular ſeed, for the whole ſeaſon. But a little practice will enable any perſon, who poſſeſſes but a very moderate capacity, to make the ſpouts feed equally, even without uſing the regulator (A).

Of the Machine when made to be uſed by Hand.—The difference of the machine in this caſe is, that it is made lighter, with but three ſpouts, without ſhafts, and is driven forwards by the handles. It hath alſo a bolt in front, which being puſhed in by the thumb, releaſes the machine; ſo that it can then eaſily be placed in a perpendicular poſition. This alteration is neceſſary to keep the handles of a convenient height, in ſowing up and down a hill, where the ſlope is conſiderable; and is done while the machine is turning at the end of the length. The method of regulating and uſing it is the ſame as when made to be drawn by a horſe.

Of the Machine when conſtructed to be uſed with a Plough.—This is, without doubt, the moſt uſeful application of the machine; and it can be fixed without difficulty to any kind of plough, in the ſame manner as to that repreſented in fig. 1.

The advantages ariſing from the uſe of it are great and numerous; for, beſides the increaſe in the crop, which will be inſured by the ſeed's being broad-caſt with a mathematical nicety, a large proportion of ſeed (the value of which alone, in a few months, will amount to more than the price of the machine) and the ſeedſman's labour will be ſaved. The ſeed may likewiſe be ſown either under or over furrow; or one caſt each way, as is practiſed by ſome farmers. The ſeed alſo, being caſt by the machine upon the freſh ploughed land, may be immediately harrowed in, before the mould has loſt any part of its moiſture; which in a dry ſeaſon will greatly promote the crop. In drilling any kind of grain, pulſe, or ſeed, it poſſeſſes every property that can be wiſhed for in the beſt drill-plough, nor will it (as moſt of them do) bruiſe the ſeed, or feed irregularly. The conſtruction of the machine is the ſame as the large ones, except being made with one hopper and ſpout inſtead of ſeveral, and the apron moveable inſtead of being fixed, as may be ſeen by inſpecting fig. 4. The only alteration neceſſary to make the machine broad-caſt or drill is, in the former caſe to place the apron B, fig. 1, at the bottom of the machine, upon the hooks FF, ſloping either towards the furrows or the imploughed land, according as it is intended to ſow the ſeed, either under or over furrow. Whenever the apron is required to be ſhifted, it is done in leſs than a ſecond of time; as it only requires to be moved up or down with the hand, when a catch fixes it.

To prepare it for drilling, inſtead of the apron, place the long ſpout, fig. 10, upon the brackets, on the front of the machine, by the ears AA, to receive the ſeed from the upper ſpout, and faſten the lower end of it, by a ſmall cord, to that hook upon which the apron is hung for broad-caſting, which is next the plough (ſee fig. 3.) the ſeed will then be directed by the long ſpout, to the centre of the furrow, near the heel of the plough. The ſpring for correcting the ſtrength of the ſtroke, is neceſſary only when they are required to go along the ſide of a conſiderable declivity. The machine, when fixed to a plough, does not require the ſmalleſt degree of ſkill in uſing, as nothing is neceſſary but to keep the hopper filled, which will contain a ſufficient quantity of ſeed to go upwards of 140 rods, before it will want re-filling, when three buſhels and a half are ſown on an acre. The accuracy with which it will broad-caſt, may in ſome meaſure be conceived, by conſidering that the ſeed regularly deſcends upon the apron or ſhelf, and is from thence ſcattered upon the ground, in quantity exactly proportioned to the ſpeed of the plough: alſo that each caſt ſpreads to the third furrow; and by this means ſhuts upon the laſt. In this manner it is continually filling up till the whole field is completely covered; ſo that it is impoſſible to leave the ſmalleſt ſpace without its proper quantity of ſeed.

When the plough is wanted for any other purpoſe,

(A) Proper directions are given with each machine for uſing it, as alſo for fixing the ſliders to ſow any particular quantity of corn or ſeed on an acre, ſo as to enable any perſon to ſet the ſpouts.

The prices of the machine (excluſive of the packing caſes) are as follow. If conſtructed to be uſed with a ſingle furrow plough; the wheel, with the axle and cheeks ſteeled, ſtrap, regulator, braſs-plates for broad-caſting or drilling turnips, lucerne, tares, wheat, barley, &c. &c. &c. and every article neceſſary for fixing it included, three guineas and a half. If made with a ſpring (for ſowing on the ſide of a hill, where the ſlope is conſiderable) but which is very rarely neceſſary, five ſhillings more. If made to be fixed to any double-furrow plough, four guineas and a half.

The large machine, fig. 2. when made to broad-caſt ſeven furrows at a time, and to be drawn by a horſe, eight guineas and a half. If conſtructed to ſow five furrows at a time, and to be uſed by hand, ſix guineas. Theſe are alſo five ſhillings more if made with a ſpring.

the machine, with the wheel at the heel of the plough for giving it motion, can be removed or replaced at any time in five minutes.

Fig. 11. repreſents the machine fixed to a double-furrow creaſing plough, and prepared for drilling. As this plough may not be generally known, it will not be improper to obſerve, that it is chiefly uſed for creaſing the land with furrows (after it has been once ploughed and harrowed); which method is neceſſary when the ſeed is to be ſown broad-caſt upon land that has been a clover-lay, &c. becauſe, if the ſeed be thrown upon the rough furrows, a conſiderable part of it will fall between them, and be unavoidably loſt, by laying too deep buried in the earth. This mode anſwers extremely well, and partakes of both methods of culture; the ſeed, though ſown broad-caſt, falling chiefly into the furrows.

The machine is very uſeful for ſowing in this manner; as the ſeed is broad-caſt, with an inconceivable regularity, at the time the land is creaſed. The advantages it likewiſe poſſeſſes for drilling all ſorts of grain or ſeed with this plough, are too evident to need mentioning.

The machine, when conſtructed to be uſed with a double-furrow plough, is made with two upper and two long ſpouts for drilling, two aprons for broad-caſting, and with a double hopper; but in other reſpects the ſame as when intended for a ſingle furrow plough: it is uſed in all caſes with the greateſt eaſe imaginable.

The interval between the points of the two ſhares of a creaſing plough is uſually ten inches; the beam about nine feet long; and the whole made of a light conſtruction.

Plate. IX *A more particular explanation of the figures.*—Fig. 1. The machine fixed to a Kentiſh turn wreſt plough. A, The machine. B, The apron upon which the ſeed falls and rebounds upon the land, in broad-caſting. C, Lid to cover the hopper. D, Wheel at the heel of the plough. E, ſtrap. FF, Hooks, upon which the apron turns by a pivot on each ſide. G, Stays, to keep the machine ſteady. H, Lever, to prevent it from ſowing.

Fig. 2. The machine conſtructed to be drawn by a horſe. AAAA, The hoppers. BB, The diagonal ſupporters. CCCC, The upper ſpouts. D, The apron or ſhelf upon which the ſeed falls from the upper ſpouts. E, The lever, which carries back the bar, and prevents the machine from ſowing. FF, Staples upon the handles, through which the reins paſs, for the man who conducts the machine, to direct the horſe by. I, Screw, to fix the machine occaſionally. N. B. The knobs (by turning which each particular ſpout may be taken from off the bar, and thereby prevented from feeding) are over each upper ſpout; but, to prevent confuſion, are not lettered in the Plate.

Fig. 3. Is the ſame machine with that in fig. 1. The dotted lines, expreſſing the ſituation of the long ſpout, when the apron is removed, and the machine adapted for drilling.

Fig. 4. Alſo the ſame machine, with the front laid open to ſhow the inſide. A, The catch-wheel fixed upon the axle. BB, The axle upon which the machine hangs between the handles of the plough. C, The pully, by which the ſtrap from the wheel at the heel of the plough turns the catch-wheel. D, The bar, upon which the upper ſpout reſts, ſuſpended by the diagonal ſupporters EE, bearing againſt the catch-wheel by the trigger F, and thereby kept in motion while the plough is going. G, The apron in a ſloping poſition, upon which the corn or ſeed falls from the upper ſpout, and is ſcattered by rebounding upon the land. It turns upon pivots, and by this means throws the ſeed either towards the right hand or left at pleaſure.

Fig. 5. The upper ſpout.

Fig. 6. The plate which is placed between the bridge and the ſlider, for ſowing ſmall ſeeds. The aperture A being downwards for ſowing turnips; the larger one B downwards for ſowing clover, &c.

Fig. 7. The bridge, fixed in the upper ſpouts. A, The ſlider, which contracts or enlarges the different apertures. B, The aperture in the bridge, through which the ſeed paſſes, when ſowing any quantity from one buſhel upwards on an acre.

Fig. 8. The regulator, made of braſs. D, The ſlider or horſe which moves upon it, and is fixed at any particular degree by a ſcrew in its ſide.

Fig. 9. Repreſents the movement in the machine fig. 2. AAAA, Cleets, between which the upper ſpouts reſt. BB, The diagonal ſupporters, by which the bar with the upper ſpouts hang. C, The catch-wheel. DD, The axle. E, The trigger upon the bar, which bears againſt the catch-wheel. FF, Stays from the back of the machine, by which the bar plays.

Fig. 10. The long ſpout. AA, The ears by which it hangs.

SECT. II. *Preparing Land for Cropping.*

1. OBSTRUCTIONS to CROPPING.

160 Obſtructions, *viz.* 107 Stones.

IN preparing land for cropping, the firſt thing that occurs, is to conſider the obſtructions to regular ploughing. The moſt formidable of theſe are *ſtones* lying above or below the ſurface, which are an impediment to a plough, as rocks are to a ſhip. Stones above the ſurface may be avoided by the ploughman, though not without loſs of ground; but ſtones below the ſurface are commonly not diſcovered till the plough be ſhattered to pieces, and perhaps a day's work loſt. The clearing land of ſtones is therefore neceſſary to prevent miſchief. And to encourage the operation, it is attended with much actual profit. In the firſt place, the ſtones are uſeful for fences: when large they muſt be blown, and commonly fall into parts proper for building. And as the blowing, when gunpowder is furniſhed, does not exceed a halfpenny for each inch that is bored, theſe ſtones come generally cheaper than to dig as many out of the quarry. In the next place, as the ſoil round a large ſtone is commonly the beſt in the field, it is purchaſed at a low rate by taking out the ſtone. Nor is this a trifle; for not only is the ground loſt that is occupied by a large ſtone, but alſo a conſiderable ſpace round it, to which the plough has not acceſs without danger. A third advantage is greater than all the reſt; which is, that the ploughing can be carried on with much expedition, when there is no apprehenſion of ſtones: in ſtony land, the plough muſt proceed ſo ſlow, as not to perform half of its work.

To clear land of ſtones, is in many inſtances an undertaking

Practice. dertaking too expenſive for a tenant who has not a very long leaſe. As it is profitable both to him and to his landlord, it appears reaſonable that the work ſhould be divided, where the leaſe exceeds not nineteen years. It falls naturally upon the landlord to be at the expence of blowing the ſtones, and upon the tenant to carry them off the field.

108 Wetneſs. Another obſtruction is *wet ground.* Water may improve gravelly or ſandy ſoils; but it ſours (A) a clay ſoil, and converts low ground into a moraſs, unfit for any purpoſe that can intereſt the huſbandman.

A great deal has been written upon different methods of draining land, moſtly ſo expenſive as to be ſcarce fit for the landlord, not to mention the tenant.

One way of draining without expence when land is to be incloſed with hedge and ditch, is to direct the ditches ſo as to carry off the water. But this method is not always practicable, even where the diviſions lie convenient for it. If the run of water be conſiderable, it will deſtroy the ditches, and lay open the fences, eſpecially where the ſoil is looſe or ſandy.

If ditches will not anſwer, hollow drains are ſometimes made, and ſometimes open drains, which muſt be made ſo deep as to command the water. The former is filled up with looſe ſtones, with bruſh-wood, or with any other porous matter that permits the water to paſs. The latter is left open, and not filled up. To make the former effectual, the ground muſt have ſuch a ſlope as to give the water a briſk courſe. To execute them in level ground is a groſs error: the paſſages are ſoon ſtopped up with ſand and ſediment, and the work is rendered uſeleſs. This inconvenience takes not place in open drains; but they are ſubject to other inconveniencies: They are always filling up, to make a yearly reparation neceſſary; and they obſtruct both ploughing and paſturing.

The following is the beſt in all views. It is an open drain made with the plough, cleaving the ſpace intended for the drain over and over, till the furrow be made of a ſufficient depth for carrying off the water. The ſlope on either ſide may, by repeated ploughings, be made ſo gentle as to give no obſtruction either to the plough or to the harrow. There is no occaſion for a ſpade, unleſs to ſmooth the ſides of the drain, and to remove accidental obſtructions in the bottom. The advantages of this drain are manifold. It is executed at much leſs expence than either of the former; and it is perpetual, as it can never be obſtructed. In level ground, it is true, graſs may grow at the bottom of the drain; but to clear off the graſs once in four or five years, will reſtore it to its original perfection. A hollow drain may be proper between the ſpring-head and the main drain, where the diſtance is not great; but in every other caſe the drain recommended is the beſt.

Where a level field is infeſted with water from higher ground, the water ought to be intercepted by a ditch carried along the foot of the high ground, and terminating in ſome capital drain.

The only way to clear a field of water that is hollow in the middle, is to carry it off by ſome drain ſtill lower. This is commonly the caſe of a moraſs fed with water from higher ground, and kept on the ſurface by a clay bottom.

A clay ſoil of any thickneſs is never peſtered with ſprings; but it is peſtered with rain, which ſettles on the ſurface as in a cup. The only remedy is high narrow ridges, well rounded. And to clear the furrows, the furrow of the foot-ridge ought to be conſiderably lower, in order to carry off the water cleverly. It cannot be made too low, as nothing hurts clay ſoil more than the ſtagnation of water on it: witneſs the hollows at the end of crooked ridges, which are abſolutely barren. Some gravelly ſoils have a clay bottom; which is a ſubſtantial benefit to a field when in graſs, as it retains moiſture. But when in tillage, ridges are neceſſary to prevent rain from ſettling at the bottom; and this is the only caſe where a gravelly ſoil ought to be ridged.

Clay ſoils that have little or no level, have ſometimes a gravelly bottom. For diſcharging the water, the beſt method is, at the end of every ridge to pierce down to the gravel, which will abſorb the water. But if the furrow of the foot-ridge be low enough to receive all the water, it will be more expeditious to make a few holes in that furrow. In ſome caſes, a field may be drained by filling up the hollows with earth taken from higher ground. But as this method is expenſive, it will only be taken where no other method anſwers. Where a field happens to be partly wet, partly dry, there ought to be a ſeparation by a middle ridge, if it can be done conveniently; and the dry part may be ploughed while the other is drying.

The low part of Berwickſhire is generally a brick clay, extremely wet and poachy during winter. This in a good meaſure may be prevented by proper incloſing, as there is not a field but can be drained into lower ground all the way down to the river Tweed. But, as this would leſſen the quantity of rain in a dry climate, ſuch as is all the eaſt ſide of Britain, it may admit of ſome doubt whether the remedy would not be as bad as the diſeaſe. (*See the article* DRAINING.)

2. Bringing into CULTURE, LAND from the STATE of NATURE.

109 Mooriſh ground. To improve a moor, let it be opened in winter when it is wet; which has one convenience, that the plough cannot be employed at any other work. In ſpring, after froſt is over, a ſlight harrowing will fill up the ſeams with mould, to keep out the air, and rot the ſod. In that ſtate let it lie the following ſummer and winter, which will rot the ſod more than if laid open to the air by ploughing. Next April, let it be croſs-ploughed, braked, and harrowed, till it be ſufficiently pulverized. Let the manure laid upon it, whether lime or dung, be intimately mixed with the ſoil by repeated harrowings. This will make a fine bed for turnip-ſeed if ſown broad-caſt. But if drills be intended, the method muſt be

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(A) By this expreſſion it is not meant that the ground really becomes acid, but only that it becomes unfit for the purpoſes of vegetation. The natural products of ſuch a ſoil are ruſhes and *ſour graſs*: which laſt appears in the furrows, but ſeldom in the crown of the ridge; is dry and taſteleſs like a chip of wood; and feels rough when ſtroked backwards.

be followed that is directed afterward in treating more directly of the culture of turnip.

A ſucceſsful turnip-crop, fed on the ground with ſheep, is a fine preparation for laying down a field with graſs-ſeeds. It is an improvement upon this method, to take two or three ſucceſſive crops of turnip, which will require no dung for the ſecond and following crops. This will thicken the ſoil, and enrich it greatly.

110 Swampy ground.

The beſt way of improving ſwampy ground after draining, is paring and burning. But where the ground is dry, and the ſoil ſo thin as that the ſurface cannot be pared, the beſt way of bringing it into tilth from the ſtate of nature, as mentioned above, is to plough it with a feathered ſock, laying the graſſy ſurface under. After the new ſurface is mellowed with froſt, fill up all the ſeams by harrowing croſs the field, which by excluding the air will effectually rot the ſod. In this ſtate let it lie ſummer and winter. In the beginning of May after, a croſs-ploughing will reduce all to ſmall ſquare pieces, which muſt be pulverized with the brake, and make it ready for a May or June crop. If theſe ſquare pieces be allowed to lie long in the ſap without breaking, they will become tough and not be eaſily reduced.

3. Forming RIDGES.

111 Of ridges.

THE firſt thing that occurs on this head, is to conſider what grounds ought to be formed into ridges, and what ought to be tilled with a flat ſurface. Dry ſoils, which ſuffer by a lack of moiſture, ought to be tilled flat, which tends to retain moiſture. And the method for ſuch tilling, is to go round and round from the circumference to the centre, or from the centre to the circumference. This method is advantageous in point of expedition, as the whole is finiſhed without once turning the plough. At the ſame time, every inch of the ſoil is moved, inſtead of leaving either the crown or the furrow unmoved, as is commonly done in tilling ridges. Clay ſoil, which ſuffers by water ſtanding on it, ought to be laid as dry as poſſible by proper ridges. A loamy ſoil is the middle between the two mentioned. It ought to be tilled flat in a dry country, eſpecially if it incline to the ſoil firſt mentioned. In a moiſt country, it ought to be formed into ridges, high or low according to the degree of moiſture and tendency to clay.

In grounds that require ridging, an error prevails, that ridges cannot be raiſed too high. High ridges labour under ſeveral diſadvantages. The ſoil is heaped upon the crown, leaving the furrows bare: the crown is too dry, and the furrows too wet: the crop, which is always beſt on the crown, is more readily ſhaken with the wind, than where the whole crop is of an equal height: the half of the ridge is always covered from the ſun, a diſadvantage which is far from being ſlight in a cold climate. High ridges labour under another diſadvantage in ground that has no more level than barely ſufficient to carry off water: they ſink the furrows below the level of the ground; and conſequently retain water at the end of every ridge. The furrows ought never to be ſunk below the level of the ground. Water will more effectually be carried off by leſſening the ridges both in height and breadth: a narrow ridge, the crown of which is but 18 inches higher than the furrow, has a greater ſlope than a very broad ridge where the difference is three or four feet.

Next, of forming ridges where the ground hangs conſiderably. Ridges may be too ſteep as well as too horizontal; and if to the ridges be given all the ſteepneſs of a field, a heavy ſhower may do irreparable miſchief. To prevent ſuch miſchief, the ridges ought to be ſo directed croſs the field, as to have a gentle ſlope for carrying off water ſlowly, and no more. In that reſpect, a hanging field has greatly the advantage of one that is nearly horizontal; becauſe, in the latter, there is no opportunity of a choice in forming the ridges. A hill is of all the beſt adapted for directing the ridges properly. If the ſoil be gravelly, it may be ploughed round and round, beginning at the bottom, and aſcending gradually to the top in a ſpiral line. This method of ploughing a hill, requires no more force than ploughing on a level; and at the ſame time removes the great inconvenience of a gravelly hill, that rains go off too quickly; for the rain is retained in every furrow. If the ſoil be ſuch as to require ridges, they may be directed to any ſlope that is proper.

In order to form a field into ridges, that has not been formerly cultivated, the rules mentioned are eaſily put in execution. But what if ridges be already formed, that are either crooked or too high? After ſeeing the advantage of forming a field into ridges, people were naturally led into an error, that the higher the better. But what could tempt them to make their ridges crooked? Certainly this method did not originate from deſign; but from the lazineſs of the driver ſuffering the cattle to turn too haſtily, inſtead of making them finiſh the ridge without turning. There is more than one diſadvantage in this ſlovenly practice. Firſt, the water is kept in by the curve at the end of every ridge, and ſours the ground. Next, as a plough has the leaſt friction poſſible in a ſtraight line, the friction muſt be increaſed in a curve, the back part of the mould-board preſſing hard on the one hand, and the coulter preſſing hard on the other. In the third place, the plough moving in a ſtraight line, has the greateſt command in laying the earth over. But where the ſtraight line of the plough is applied to the curvature of a ridge in order to heighten it by gathering, the earth moved by the plough, is continually falling back, in ſpite of the moſt ſkilful ploughman.

The inconveniencies of ridges high and crooked are ſo many, that one would be tempted to apply a remedy at any riſk. And yet, if the ſoil be clay, it would not be adviſeable for a tenant to apply the remedy upon a leaſe ſhorter than two nineteen years. In a dry gravelly ſoil, the work is not difficult nor hazardous. When the ridges are cleaved two or three years ſucceſſively in the courſe of cropping, the operation ought to be concluded in one ſummer. The earth, by reiterated ploughings, ſhould be accumulated upon the furrows, ſo as to raiſe them higher than the crowns: they cannot be raiſed too high, for the accumulated earth will ſubſide by its own weight. Croſs-ploughing once or twice will reduce the ground to a flat ſurface, and give opportunity to form ridges at will. The ſame method brings down ridges in clay ſoil: only let care be taken to carry on the work with expedition; becauſe a hearty ſhower, before the new ridges are formed, would ſoak the ground in water, and make the farmer ſuſpend his work for the remainder of that year at leaſt. In a ſtrong clay, we would not venture to alter the ridges, unleſs it can be done to perfection in one ſeaſon.—On this ſubject Mr Anderſon has the following obſervations*.

112
Inconveniences in the common methods of levelling.

"The difficulty of performing this operation properly with the common implements of huſbandry, and the obvious benefit that accrues to the farmer from having his fields level, has produced many new inventions of ploughs, harrows, drags, &c. calculated for ſpeedily reducing the fields to that ſtate; none of which have as yet been found fully to anſwer the purpoſe for which they were intended, as they all indiſcriminately carry the earth that was on the high places into thoſe that were lower; which, although it may, in ſome caſes, render the ſurface of the ground tolerably ſmooth and level, is uſually attended with inconveniences far greater for a conſiderable length of time, than that which it was intended to remove.

113
Vegetable mould becomes inert by being long buried.

"For experience ſufficiently ſhows, that even the beſt vegetable mould, if buried for any length of time ſo far beneath the ſurface as to be deprived of the benign influences of the atmoſphere, loſes its *vis vitæ*, if I may be allowed that expreſſion; becomes an inert, lifeleſs maſs, little fitted for nouriſhing vegetables; and conſtitutes a ſoil very improper for the purpoſes of the farmer. It therefore behoves him, as much as in him lies, to preſerve, on every part of his fields, an equal covering of that vegetable mould that has long been uppermoſt, and rendered fertile by the meliorating influence of the atmoſphere. But, if he ſuddenly levels his high ridges by any of theſe mechanical contrivances, he of neceſſity buries all the good mould that was on the top of the ridges in the old furrows; by which he greatly impoveriſhes one part of his field, while he too much enriches another; inſomuch that it is a matter of great difficulty, for many years thereafter, to get the field brought to an equal degree of fertility in different places; which makes it impoſſible for the farmer to get an equal crop over the whole of his field by any management whatever: and he has the mortification frequently, by this means, to ſee the one half of his crop rotted by an over-luxuriance, while other parts of it are weak and ſickly, or one part ripe and ready for reaping, while the other is not properly filled; ſo that it were, on many occaſions, better for him to have his whole field reduced at once to the ſame degree of poorneſs as the pooreſt of it, than have it in this ſtate. An almoſt impracticable degree of attention in ſpreading the manures may indeed in ſome meaſure get the better of this; but it is ſo difficult to perform this properly, that I have frequently ſeen fields that had been thus levelled, in which, after thirty years of continued culture and repeated dreſſings, the marks of the old ridges could be diſtinctly traced when the corn was growing, altho' the ſurface was ſo level that no traces of them could be perceived when the corn was off the ground.

"But this is a degree of perfection in levelling that cannot be uſually attained by following this mode of practice; and, therefore, is but ſeldom ſeen. For all that can be expected to be done by any levelling machine, is to render the ſurface perfectly ſmooth and even in every part, at the time that the operation is performed: but as, in this caſe, the old hollows are ſuddenly filled up with looſe mould to a great depth, while the earth below the ſurface upon the heights of the old ridges remains firm and compact, the new-raiſed earth after a ſhort time ſubſides very much, while the other parts of the field do not ſink at all; ſo that in a ſhort time the old furrows come to be again below the level of the other parts of the field, and the water of courſe is ſuffered in ſome degree to ſtagnate upon them; inſomuch that, in a few years, it becomes neceſſary once more to repeat the ſame levelling proceſs, and thus renew the damage that the farmer ſuſtains by this pernicious operation.

114
Levelling ſometimes not to be attempted.

"On theſe accounts, if the farmer has not a long leaſe, it will be found in general to be much his intereſt to leave the ridges as he found them, rather than to attempt to alter their direction; and, if he attends with due caution to moderate the height of theſe old ridges, he may reap very good crops, although perhaps at a ſomewhat greater expence of labour than he would have been put to upon the ſame field, if it had been reduced to a proper level ſurface, and divided into ſtraight and parallel ridges.

"But, where a man is ſecure of poſſeſſing his ground for any conſiderable length of time, the advantages that he will reap from having level and well laid-out fields, are ſo conſiderable as to be worth purchaſing, if it ſhould even be at a conſiderable expence. But the loſs that is ſuſtained at the beginning, by this mechanical mode of levelling ridges, if they are of a conſiderable height, is ſo very great, that it is perhaps doubtful if any future advantages can ever fully compenſate it. I would therefore adviſe, that all this levelling apparatus ſhould be laid aſide; and the following more efficacious practice be ſubſtituted in its ſtead: A practice that I have long followed with ſucceſs, and can ſafely recommend as the very beſt that has yet come to my knowledge.

115
Beſt method of levelling.

"If the ridges have been raiſed to a very great height, as a preparation for the enſuing operations, they may be firſt *cloven*, or *ſcaled* out, as it is called in different places; that is, ploughed ſo as to lay the earth on each ridge from the middle towards the furrows. But, if they are only of a moderate degree of height, this operation may be omitted. When you mean to proceed to level the ground, let a number of men be collected, with ſpades, more or fewer as the nature of the ground requires, and then ſet a plough to draw a furrow directly acroſs the ridges of the whole field intended to be levelled. Divide this line into as many parts as you have labourers, allotting to each one ridge or two, or more or leſs, according to their number, height, and other circumſtances. Let each of the labourers have orders, as ſoon as the plough has paſſed that part aſſigned him, to begin to dig in the bottom of the furrow that the plough has juſt made, about the middle of the ſide of the old ridge, keeping his face towards the old furrow, working backwards till he comes to the height of the ridge, and then turn towards the other furrow, and repeat the ſame on the other ſide of the ridge, always throwing the earth that he digs up into the deep old furrow between the ridges, that is directly before him; taking care not to dig deep where he firſt begins, but to go deeper and deeper as he advances to the height of the ridge, ſo as to leave the bottom of the trench he thus makes acroſs the ridge entirely level, or as nearly ſo as poſſible. And when he has finiſhed that part of the furrow allotted to him that the plough has made in going, let him then go and finiſh in the ſame manner his own portion of the furrow that the plough makes in returning. In this manner, each man performs his own taſk through the whole field, gradually raiſing the old furrows as the old heights are depreſſed. And, if an attentive overſeer is at hand, to ſee that the whole is equally well done, and that each furrow is raiſed to a greater height than the middle of the old ridges, ſo as to allow for the ſubſiding of the looſe earth, the operation will be entirely finiſhed at once, and never again need to be repeated.

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* Eſſays on Agriculture. Vol.I.p.146

“ In performing this operation, it will always be proper to make the ridges, formed for the purpoſe of levelling, which go acroſs the old ridges, as broad as poſſible; becauſe the deep trench that is thus made in each of the furrows is an impediment in the future operations, as well as the height that is accumulated in the middle of each of theſe ridges; ſo that the fewer there are of theſe, the better it is. The farmer, therefore, will do well to advert to this in time, and begin by forming a ridge by always turning the plough to the right hand, till it becomes of ſuch a breadth as makes it very inconvenient to turn longer in that manner; and then, at the diſtance of twice the breadth of this new-formed ridge from the middle of it, mark off a furrow for the middle of another ridge, turning round it to the right hand, in the ſame manner as was done in the former, till it becomes of the ſame breadth with it; and then, turning to the left hand, plough out the interval that was left between the two new-formed ridges. By this mode of ploughing, each ridge may be made of 40, or 50 or 60 yards in breadth, without any great inconvenience; for although ſome time will be loſt in turning at the ends of theſe broad ridges, yet, as this operation is only to be once performed in this manner, the advantage that is reaped by having few open furrows, is more than ſufficient to counterbalance it. And, in order to moderate the height that would be formed in the middle of each of theſe great ridges, it will always be proper to mark out the ridges, and draw the furrow that is to be the middle of each ſome days before you collect your labourers to level the field; that you may, without any hurry or loſs of labour, clear out a good trench through the middle of each of the old ridges; as the plough at this time going and returning nearly in the ſame track, prevents the labourers from working properly without this precaution.

“ If theſe rules are attended to, your field will be at once reduced to a proper level, and the rich earth that formed the ſurface of the old ridges be ſtill kept upon the ſurface of your field; ſo that the only loſs that the poſſeſſor of ſuch ground can ſuſtain by this operation, is merely the expence of performing it.”

He afterwards makes a calculation of the different expences of levelling by the plough and by the ſpade, in which he finds the latter by far the cheapeſt method.

116
Proper direction of the ridges.

Let it be a rule, to direct the ridges north and ſouth, if the ground will permit. In this direction, the eaſt and weſt ſides of the ridges, dividing the ſun equally between them, will ripen at the ſame time.

117
Narrow ridges an advantage.

It is a great advantage in agriculture, to form ridges ſo narrow, and ſo low, as to admit the crowns and furrows to be changed alternately every crop. The ſoil neareſt the ſurface is the beſt; and by ſuch ploughing, it is always kept near the ſurface, and never buried. In high ridges, the ſoil is accumulated at the crown and the furrows left bare. Such alterations of crown and furrow, is eaſy where the ridges are no more but ſeven or eight feet broad. This mode of ploughing anſwers perfectly well in ſandy and gravelly ſoils, and even in loam; but it is not ſafe in clay ſoil. In that ſoil, the ridges ought to be 12 feet wide, and 20 inches high; to be preſerved always in the ſame form by caſting, that is, by ploughing two ridges together, beginning at the furrow that ſeparates them, and ploughing round and round till the two ridges be finiſhed. By this method, the ſeparating furrow is raiſed a little higher than the furrows that bound the two ridges. But at the next ploughing, that inequality is corrected, by beginning at the bounding furrows, and going round and round till the ploughing of the two ridges be completed at the ſeparating furrow.

4. Clearing Ground of Weeds.

118
Cleaning harrow.
Plate VI. fig. 6.

For this purpoſe a new inſtrument, termed a *cleaning harrow*, has been introduced by Lord Kames, and is ſtrongly recommended (b). It is one entire piece like the firſt of thoſe mentioned above, conſiſting of ſeven bulls, four feet long each, two and one-fourth inches broad, two and three-fourths deep. The bulls are united together by ſheths, ſimilar to what are mentioned above. The intervals between the bulls being three and three-fourths inches, the breadth of the whole harrow is three feet five inches. In each bull are inſerted eight teeth, each nine inches free below the wood, and diſtant from each other ſix inches. The weight of each tooth is a pound, or near it. The whole is firmly bound by an iron plate from corner to corner in the line of the draught. The reſt as in the harrows mentioned above. The ſize, however, is not invariable. The cleaning harrow ought to be larger or leſs according as the ſoil is ſtiff or free.

To give this inſtrument its full effect, ſtones of ſuch a ſize as not to paſs freely between the teeth ought to be carried off, and clods of that ſize ought to be broken. The ground ought to be dry, which it commonly is in the month of May.

In preparing for barley, turnip, or other ſummer-crop, begin with ploughing and croſs-ploughing. If the ground be not ſufficiently pulverized, let the great brake be applied, to be followed ſucceſſively with the 1ſt and 2d harrows. In ſtiff ſoil, rolling may be proper, or twice between the acts. Theſe operations will looſen every root, and bring ſome of them to the ſurface. This

Plate VI. fig. 3, 4.

(b) In his *Gentleman Farmer*; to which performance the practical part of this article is materially indebted.

Fig. 5. This is the the time for the 3d harrow, conducted by a boy mounted on one of the horſes, who trots ſmartly along the field, and brings all the roots to the ſurface: there they are to lie for a day or two, till perfectly dry. If any ſtones or clods remain, they muſt be carried off in a cart. And now ſucceeds the operation of the cleaning harrow. It is drawn by a ſingle horſe, directed by reins, which the man at the oppoſite corner puts over his head, in order to have both hands free. In this corner is fixed a rope, with which the man from time to time raiſes the harrow from the ground, to let the weeds drop. For the ſake of expedition, the weeds ought to be dropt in a ſtraight line croſs the field, whether the harrow be full or not; and ſeldom is a field ſo dirty but that the harrow may go 30 yards before the teeth are filled. The weeds will be thus laid in parallel rows, like thoſe of hay raked together for drying. A harrow may be drawn ſwiftly along the rows, in order to ſhake out all the duſt; and then the weeds may be carried clean off the field in carts. But we are not yet done with theſe weeds: inſtead of burning, which is the ordinary practice, they may be converted into uſeful manure, by laying them in a heap with a mixture of hot dung to begin fermentation. At firſt view, this way of cleaning land will appear operoſe; but upon trial, neither the labour nor expence will be found immoderate. At any rate, the labour and expence ought not to be grudged; for if a field be once thoroughly cleaned, the ſeaſons muſt be very croſs, or the farmer very indolent, to make it neceſſary to renew the operation in leſs than 20 years. In the worſt ſeaſons, a few years paſture is always under command; which effectually deſtroys triennial plants, ſuch as thiſtles and couch-graſs.

5. On the Nature of different kinds of Soils, and the Plants proper to each.

1. Clay, which is in general the ſtiffeſt of all ſoils, and contains an unctuous quality. But under the term *clays*, earths of different ſorts and colours are included. One kind is ſo obſtinate, that ſcarcely any thing will ſubdue it; another is ſo hungry and poor, that it abſorbs whatever is applied, and turns it into its own quality. Some clays are fatter than others, and the fatteſt are the beſt; ſome are more ſoft and ſlippery. But all of them retain water poured on their ſurfaces, where it ſtagnates, and chills the plants, without ſinking into the ſoil. The cloſeneſs of clay prevents the roots and fibres of plants from ſpreading in ſearch of nouriſhment. The blue, the red, and the white clay, if ſtrong, are unfavourable to vegetation. The ſtony and looſer ſort are leſs ſo; but none of them are worth any thing till their texture is ſo looſened by a mixture of other ſubſtances, and opened, as to admit the influence of the ſun, the air, and froſts. Among the manures recommended for clay, ſand is of all others to be preferred; and ſea-ſand the beſt of all where it can be obtained: This moſt effectually breaks the coheſion.

The reaſon for preferring ſea-ſand is, that it is not formed wholly (as moſt other ſands are) of ſmall ſtones; but contains a great deal of calcareous matter in it, ſuch as, ſhells grated and broken to pieces by the tide; and alſo of ſalts. The ſmaller the ſand is the more eaſily it penetrates the clay; but it abides leſs time in it than the larger.

The next beſt ſand is that waſhed down by rains on gravelly ſoils. Thoſe which are dry and light are the worſt. Small gritty gravel has alſo been recommended by the beſt writers on agriculture for theſe ſoils; and in many inſtances we have found them to anſwer the purpoſe.

Shell marle, aſhes, and all animal and vegetable ſubſtances, are very good manures for clay; but they have been found moſt beneficial when ſand is mixed with them. Lime has been often uſed, but the writer of this ſection would not recommend it, for he never found any advantage from it ſingly, when applied to clays.

The crops moſt ſuitable for ſuch lands are, wheat, beans, cabbages, and rye-graſs. Clover ſeldom ſucceeds, nor indeed any plants whoſe roots require depth, and a wide ſpread in the earth.

2. Chalk. Chalky ſoils are generally dry and warm, and if there be a tolerable depth of mould, fruitful; producing great crops of barley, rye, peaſe, vetches, clover, trefoil, burnet, and particularly ſain-foin. The latter plant flouriſhes in a chalky ſoil better than any other. But if the ſurface of mould be very thin, this ſoil requires good manuring with clay, marle, loam, or dung. As theſe lands are dry, they may be ſown earlier than others.

When your barley is three inches high, throw in 10 ℔. of clover, or 15 ℔. of trefoil, and roll it well. The next ſummer mow the crop for hay; feed off the aftermath with ſheep; and in winter give it a top-dreſſing of dung. This will produce a crop the ſecond ſpring, which ſhould be cut for hay. As ſoon as this crop is carried off, plough up the land, and in the beginning of September ſow three buſhels of rye per acre, either to feed off the ſheep in the ſpring or to ſtand for harveſt. If you feed it off, ſow winter vetches in Auguſt or September, and make them into hay the following ſummer. Then get the land into as fine tilth as poſſible, and ſow it with ſain-foin, which with a little manure once in two or three years, will remain and produce good crops for 20 years together.

3. Light poor land, which ſeldom produces good crops of any thing till well manured. After it is well ploughed, ſow three buſhels of buck-wheat per acre, in April or May: When in bloom, let your cattle in a few days to eat off the beſt, and tread the other down; this done, plough in what remains immediately. This will ſoon ferment and rot in the ground; then lay it fine, and ſow three buſhels of rye per acre. If this can be got off early enough, ſow turnips; if not, winter vetches to cut for hay. Then get it in good tilth and ſow turnip-rooted cabbages, in rows three feet apart. This plant ſeldom fails, if it has ſufficient room, and the intervals be well horſe-hoed; and you will find it the beſt ſpring-feed for ſheep when turnips are over.

The horſe-hoeing will clean and prepare the land for ſain-foin; for the ſowing of which April is reckoned the beſt ſeaſon. The uſual way is to ſow it broad-caſt, four buſhels to an acre; but the writer prefers ſowing it in drills two feet aſunder; for then it may be horſe-hoed, and half the ſeed will be ſufficient.

The horſe-hoeing will not only clean the crop, but earth up the plants, and render them more luxuriant and laſting.

If you ſow it broad-caſt, give it a top-dreſſing in December or January, of rotten dung or aſhes, or, which is ſtill better, of both mixed in compoſt.

From various trials, it is found that taking only one crop in a year, and feeding the after-growth, is better than to mow it twice. Cut it as ſoon as it is in full bloom, if the weather will permit. The hay will be the ſweeter, and the ſtrength of the plants leſs impaired, than if it ſtands till the ſeed is formed.

4. Light rich land, being the moſt eaſy to cultivate to advantage, and capable of bearing moſt kinds of grain, pulſe, and herbage, little need be ſaid upon it. One thing however is very proper to be obſerved, that ſuch lands are the beſt adapted to the drill huſbandry, eſpecially where machines are uſed, which require ſhallow furrows to be made for the reception of the ſeed. This, if not prone to couch-graſs, is the beſt of all ſoils for lucerne; which, if ſown in two feet drills, and kept clean, will yield an aſtoniſhing quantity of the moſt excellent herbage. But lucerne will never be cultivated to advantage where couch-graſs and weeds are very plentiful; nor in the broad caſt method, even where they are not ſo; becauſe horſe-hoeing is eſſential to the vigorous growth of this plant.

5. Coarſe rough land. Plough deep in autumn; when it has lain two weeks, croſs-plough it, and let it lie rough through the winter. In March give it another good ploughing; drag, rake, and harrow it well, to get out the rubbiſh, and ſow four buſhels of black oats per acre if the ſoil be wet, and white oats if dry. When about four inches high, roll them well after a ſhower: This will break the clods; and the fine mould falling among the roots of the plants will promote their growth greatly.

Some ſow clover and rye graſs among the oats, but this appears to be bad huſbandry. If you deſign it for clover, ſow it ſingle, and let a coat of dung be laid on in December. The ſnow and rain will then dilute its ſalts and oil, and carry them down among the roots of the plants. This is far better than mixing the crops on ſuch land, for the oats will exhauſt the ſoil ſo much that the clover will be impoveriſhed. The following ſummer you will have a good crop of clover, which cut once, and feed the after-growth. In the winter plough it in, and let it lie till February: Then plough and harrow it well; and in March, if the ſoil be moiſt, plant beans in drills of three feet, to admit the horſe-hoe freely. When you horſe-hoe them a ſecond time, ſow a row of turnips in each interval, and they will ſucceed very well. But if the land be ſtrong enough for ſowing wheat as ſoon as the beans are off, the turnips may be omitted.

SECT. III. *Culture of particular Plants.*

119 THE articles hitherto inſiſted on, are all of them preparatory to the capital object of a farm, that of raiſing plants for the nouriſhment of man, and of other animals. Theſe are of two kinds; culmiferous and leguminous; differing widely from each other. Wheat, rye, barley, oats, rye-graſs, are of the firſt kind: of the other kind are, peaſe, beans, clover, cabbage, and many others.

120 Culmiferous plants. Culmiferous plants, ſays Bonnet, have three ſets of roots. The firſt iſſue from the ſeed, and puſh to the ſurface an upright ſtem; another ſet iſſue from a knot in that ſtem; and a third from another knot, nearer the ſurface. Hence the advantage of laying ſeed ſo deep in the ground as to afford ſpace for all the ſets.

121 Leguminous plants. Leguminous plants form their roots differently. Peaſe, beans, cabbage, have ſtore of ſmall roots, all iſſuing from the ſeed, like the undermoſt ſet of culmiferous roots; and they have no other roots. A potato and a turnip have bulbous roots. Red clover has a ſtrong tap-root. The difference between culmiferous and leguminous plants with reſpect to the effects they produce in the ſoil, will be inſiſted on afterward, in the ſection concerning rotation of crops. As the preſent ſection is confined to the propagation of plants, it falls naturally to be divided into three articles: firſt, Plants cultivated for fruit: ſecond, Plants cultivated for roots: third, Plants cultivated for leaves.

I. Plants cultivated for Fruit.

1. WHEAT and RYE.

122 Fallowing for wheat. ANY time from the middle of April to the middle of May, the fallowing for wheat may commence. The moment ſhould be choſen, when the ground, beginning to dry, has yet ſome remaining ſoftneſs; in that condition, the ſoil divides eaſily by the plough, and falls into ſmall parts. This is an eſſential article, deſerving the ſtricteſt attention of the farmer. Ground ploughed too wet, riſes, as we ſay, *whole-fur*, as when paſture-ground is ploughed: when ploughed too dry, it riſes in great lumps, which are not reduced by ſubſequent ploughings; not to mention, that it requires double force to plough ground too dry, and that the plough is often broken to pieces. When the ground is in proper order, the farmer can have no excuſe for delaying a ſingle minute. This firſt courſe of fallow muſt, it is true, yield to the barley-ſeed; but as the barley-ſeed is commonly over the firſt week of May, or ſooner, the ſeaſon muſt be unfavourable if the fallow cannot be reached by the middle of May.

As clay ſoil requires high ridges, theſe ought to be cleaved at the firſt ploughing, beginning at the furrow, and ending at the crown. This ploughing ought to be as deep as the ſoil will admit; and water-furrowing ought inſtantly to follow; for if rain happen before water-furrowing, it ſtagnates in the furrow, neceſſarily delays the ſecond ploughing till that part of the ridge be dry, and prevents the furrow from being mellowed and roaſted by the ſun. If this firſt ploughing be well executed, annual weeds will riſe in plenty.

About the firſt week of June, the great brake will looſen and reduce the ſoil, encourage a ſecond crop of annuals, and raiſe to the ſurface the roots of weeds moved by the plough. Give the weeds time to ſpring, which may be in two or three weeks. Then proceed to the ſecond ploughing about the beginning of July; which muſt be croſs the ridges, in order to reach all the ſlips of the former ploughing. By croſs-ploughing the furrows will be filled up, and water-furrowing be ſtill more neceſſary than before. Employ the brake again about the 10th of Auguſt, to deſtroy the annuals that have ſprung ſince the laſt ſtirring. The deſtruction of weeds is a capital article in fallowing: yet ſo blind are people to their intereſt, that nothing is more common than a fallow field covered with charlock and wild muſtard, all in flower, and 10 or 12 inches high. The field having now received two harrowings and two breakings, is prepared for manure, whether lime or dung, which without delay ought to be incorporated with the ſoil by a repeated harrowing and a gathering furrow. This ought to be about the beginning of September, and as ſoon after as you pleaſe the ſeed may be ſown.

As in ploughing a clay ſoil it is of importance to prevent poaching, the hinting furrows ought to be done with two horſes in a line. If four ploughs be employed in the ſame field, to one of them may be allotted the care of finiſhing the hinting furrows.

123 Dreſſing loam for wheat. Loam, being a medium between ſand and clay, is of all ſoils the fitteſt for culture, and the leaſt ſubject to chances. It does not hold water like clay; and when wet, it dries ſooner. At the ſame time, it is more retentive than ſand of that degree of moiſture which promotes vegetation. On the other hand, it is more ſubject to couch-graſs than clay, and to other weeds; to deſtroy which fallowing is ſtill more neceſſary than in clay.

Beginning the fallow about the firſt of May, or as ſoon as barley-ſeed is over, take as deep a furrow as the ſoil will admit. Where the ridges are ſo low and narrow as that the crown and furrow can be changed alternately, there is little or no occaſion for water furrowing. Where the ridges are ſo high as to make it proper to cleave them, water-furrowing is proper. The ſecond ploughing may be at the diſtance of five weeks. Two crops of annuals may be got in the interim, the firſt by the brake and the next by the harrow; and by the ſame means eight crops may be got in the ſeaſon. The ground muſt be cleared of couch-graſs and knot-graſs roots, by the cleaning harrow deſcribed above. The time for this operation is immediately before the manure is laid on. The ground at that time being in its looſeſt ſtate, parts with its graſs roots more freely than at any other time. After the manure is ſpread, and incorporated with the ſoil by breaking or harrowing, the ſeed may be ſown under furrow, if the ground hang ſo as eaſily to carry off the moiſture. To leave it rough without harrowing has two advantages: it is not apt to cake with moiſture, and the inequalities make a ſort of ſhelter to the young plants againſt froſt. But if it lie flat, it ought to be ſmoothed with a ſlight harrow after the ſeed is ſown, which will facilitate the courſe of the rain from the crown to the furrow.

124 Dreſſing a ſandy ſoil. A ſandy ſoil is too looſe for wheat. The only chance for a crop is after red clover, the roots of which bind the ſoil; and the inſtructions above given for loam are applicable here. Rye is a crop much fitter for ſandy ſoil than wheat; and, like wheat, it is generally ſown after a ſummer-fallow.

125 Time for ſowing. Laſtly, Sow wheat as ſoon in the month of October as the ground is ready. When ſown a month more early, it is too forward in the ſpring, and apt to be hurt by froſt; when ſown a month later, it has not time to root before froſt comes on, and froſt ſpews it out of the ground.

126 Setting of wheat; 127 A capital improvement in agriculture. *Setting of wheat*, a method which is reckoned one of the greateſt improvements in huſbandry that has taken place this century. It ſeems to have been firſt ſuggeſted by planting grains in a garden from mere curioſity, by perſons who had no thought or opportunity of extending it to a lucrative purpoſe. Nor was it attempted on a larger ſcale, till a little farmer near Norwich began it about 17 years ſince, upon leſs than an acre of land. For two or three years only a few followed his example; and thoſe were generally the butt of their neighbours merriment for adopting ſo ſingular a practice. They had, however, conſiderably better corn and larger crops than their neighbours: this, together with the ſaving in ſeed, engaged more to follow them: while ſome ingenious perſons, obſerving its great advantage, recommended and publiſhed its utility in the Norwich papers. Theſe recommendations had their effect. The curioſity and inquiry of the Norfolk farmers (particularly round Norwich) were excited, and they found ſufficient reaſon to make general experiments. Among the reſt was one of the largeſt occupiers of lands in that county, who ſet 57 acres in one year. His ſucceſs, from the viſible ſuperiority of his crop, both in quantity and quality, was ſo great, that the following autumn he ſet 300 acres, and has continued the practice ever ſince. This noble experiment eſtabliſhed the practice and was the means of introducing it generally among the intelligent farmers in a very large diſtrict of land; there being few who now ſow any wheat, if they can procure hands to ſet it. It has been generally obſerved, that although the ſet crops appear very thin during the autumn and winter, the plants tiller and ſpread prodigiouſly in the ſpring. The ears are indiſputably larger, without any dwarfiſh or ſmall corn; the grain is of a large bulk, and ſpecifically heavier per buſhel than when ſown.

128 Method. The lands on which this method is particularly proſperous, are either after clover ſtubble, or on which trefoil and graſs-ſeed were ſown the ſpring before the laſt. Theſe grounds, after the uſual manuring, are once turned over by the plough in an extended flag or turf, at ten inches wide; along which a man, who is called a *dibbler*, with two ſetting-irons, ſomewhat bigger than ram-rods, but conſiderably bigger at the lower end, and pointed at the extremity, ſteps backwards along the turf and makes the holes about four inches aſunder every way, and an inch deep. Into theſe holes the droppers (women, boys, and girls) drop two grains, which is quite ſufficient. After this, a gate buſhed with thorns is drawn by one horſe over the land, and cloſes up the holes. By this mode, three pecks of grain is ſufficient for an acre; and being immediately buried, it is equally removed from vermin or the power of froſt. The regularity of its riſing gives the beſt opportunity of keeping it clear from weeds, by weeding or hand-hoeing.

129 Peculiar advantages. Wheat-ſetting is a method peculiarly beneficial when corn is dear; and, if the ſeaſon be favourable, may be practiſed with great benefit to the farmer. Sir Thomas Beevor of Hethel-Hall in Norfolk, found the produce to be two buſhels per acre more than from the wheat which is ſown; but having much leſs ſmall corn intermixed with it, the ſample is better, and always fetches a higher price, to the amount generally of two ſhillings per quarter.

This method, too, ſaves to the farmer and to the public ſix pecks of ſeed-wheat in every acre; which, if nationally adopted, would of itſelf afford bread for more than half a million of people.

Add to theſe conſiderations, the great ſupport given to the poor by this *ſecond* harveſt, as it may be called, which enables them to diſcharge their rents and maintain their families without having recourſe to the pariſh.—The expence of ſetting by hand is now reduced to about ten ſhillings per acre; which, in good weather, may be done by one dibbler, attended by three droppers, in two days. This is five ſhillings per day; of which if the dibbler gives to the children ſixpence each, he will have himſelf three ſhillings and ſixpence for his day's work, which is much more than he can poſſibly earn by any other labour ſo eaſy to himſelf. But put the caſe, that the man has a wife who dibbles with him, and two or three of his own children to drop to him, you ſee his gains will then be prodigious, and enough to enſure a plenty of candidates for that work, even in the leaſt populous parts of the country.

It is, however, to be obſerved with regard to this method, that in ſeaſons when ſeed-corn is very cheap, or the autumn particularly unfavourable to the practice, it muſt certainly be leſſened. In light lands, for inſtance, a very dry time prevents dibbling; as the holes made with the inſtruments will be filled up again by the mould as faſt as the inſtrument is withdrawn. So, again, in a very wet ſeaſon, on ſtrong and ſtiff clays, the ſeeds in the holes cannot be well and properly covered by the buſhes drawn over them. But theſe extremes of dry and wet do not often happen, nor do they affect lands of a moderately conſiſtent texture, or both light and heavy ſoils at the ſame time, ſo that the general practice is in fact never greatly impeded by them.

130
Propagating of wheat by dividing the roots.

Propagating of wheat by dividing and tranſplanting its roots. In the Philoſophical Tranſactions for 1768, we meet with a very extraordinary experiment, of which the following is an abſtract. On the 2d of June 1766, Mr C. Miller ſowed ſome grains of the common red wheat; and on the 8th of Auguſt a ſingle plant was taken up and ſeparated into 18 parts, and each part planted ſeparately. Theſe plants having puſhed out ſeveral ſide-ſhoots, by about the middle of September ſome of them were then taken up and divided, and the reſt of them between that time and the middle of October. This ſecond diviſion produced 67 plants. Theſe plants remained through the winter, and another diviſion of them, made between the middle of March and the 12th of April, produced 500 plants. They were then divided no further, but permitted to remain. The plants were in general ſtronger than any of the wheat in the fields. Some of them produced upwards of 100 ears from a ſingle root. Many of the ears meaſured ſeven inches in length, and contained between 60 and 70 grains.

The whole number of ears which, by the proceſs above mentioned, were produced from one grain of wheat, was 21,109, which yielded three pecks and three quarters of clear corn, the weight of which was 47 lb. 7 ounces; and from a calculation made by counting the number of grains in an ounce, the whole number of grains was about 576,840.

By this account we find, that there was only one general diviſion of the plants made in the ſpring. Had a ſecond been made, Mr Miller thinks the number of plants would have amounted to 2000 inſtead of 500, and the produce thereby much enlarged.

The ground was a light blackiſh ſoil, upon a gravelly bottom; and, conſequently, a bad ſoil for wheat. One half of the ground was well dunged, the other half had no manure. There was, however, not any difference diſcoverable in the vigour, or growth, or produce, of the plants.

131
Method propoſed by Mr Bogle.

It muſt be evident, that the expence and labour of ſetting in the above manner by the hand, will render it impracticable upon a large ſcale, ſo as to be productive of any utility. A correſpondent of the Bath Society, therefore (Robert Bogle, Eſq; of Daldowin, near Glaſgow), with a view to extend the practice, has propoſed the uſe of the harrow and roller until ſome better implements be invented. This method occurred to him from attending to the practice uſual with farmers on certain occaſions, of harrowing their fields after the grain is ſprung up. Upon inveſtigating the principles upon which theſe practices are founded, he found them confined merely to that of pulveriſing the earth, without any attention to Mr Miller's doctrine. They ſaid, "that after very heavy rains, and then exceſſive dry weather, the ſurface of their lands were apt to be caked, the tender fibres of the young roots were thereby prevented from puſhing, and of courſe the vegetation was greatly obſtructed; in ſuch inſtances, they found very great benefit from harrowing and rolling."

Theſe principles he acknowledges to be well founded, ſo far as relates to pulveriſing; but contends, that the benefit ariſing from harrowing and rolling is not derived from pulveriſing entirely, but alſo from ſubdividing and enabling the plants to tiller (as it is termed). "The harrow (he obſerves) certainly breaks the incruſtation on the ſurface, and the roller crumbles the clods; but it is alſo obvious, that the harrow removes a great many of the plants from their original ſtations; and that if the corn has begun to tiller at the time it is uſed, the roots will be, in many inſtances, ſubdivided, and then the application of my ſyſtem of diviſibility comes into play. The roller then ſerves to plant the roots which have been torn up by the harrow."

132
Objections.

But on this the ſociety obſerve, that the teeth of a harrow are too large to divide roots ſo ſmall and tenacious as are thoſe of grain; and whenever ſuch roots (however tillered) ſtand in the line any tooth makes, they will, if ſmall, be only turned on one ſide by the earth yielding to their lateral preſſure, or, if large, the whole root will probably be drawn out of the ground. The principal uſes, therefore, derived from harrowing and rolling theſe crops are, opening the ſoil between the plants, earthing them up, breaking the clods, and cloſing the earth about their roots.

In a ſubſequent letter, Mr Bogle, without conteſting theſe points, further urges the ſcheme of propagating wheat by dividing and tranſplanting its roots. "I have converſed (ſays he) much with many practical farmers, who all admit that my plan has the appearance not only of being practical, but advantageous. I have alſo ſeen in the ninth number of Mr Young's Annals of Agriculture, the account of an experiment which ſtrongly corroborates my theory. It was made by the Rev. Mr Pike of Edmonton. From this, and other

133 Practicability of the ſcheme aſſerted.

experiments which have been made under my own eye, I foreſee clearly, that the ſyſtem is practicable, and will certainly be productive of great benefit, ſhould it become general. Beſides the ſaving of nine-tenths of ſeed in the land ſown broad-caſt, other very important advantages will attend the ſetting out of wheat from a ſeed-bed, ſuch as an early crop; the certainty of good crops; rendering a ſummer fallow unneceſſary; ſaving dung; and having your wheat perfectly free from weeds without either hand or horſe-hoeing. Five hundred plants in April produced almoſt a buſhel of grain. My gardener ſays, he can ſet one thouſand plants in a day, which is confirmed by the opinion of two other gardeners. Mr Miller found no difference in the produce of what was planted on lands that had dung, and on what had none, except where the land was improper for wheat at all."

134 Bath Society's obſervations.

On this letter we have the following note by the ſociety: "Mr Bogle will ſee, by the ſociety's premium-book this year, that by having offered ſeveral premiums for experiments of the kind he ſo earneſtly recommends, we wiſh to have his theory brought to the teſt of practice. Our reaſon for this, as well as for printing Mr B's letter, was rather to excite deciſive trials by ingenious perſons, than from any expectation of the practice ever becoming a general one. General, indeed, it never can be. A ſufficient number of hands could not be found to do it. Unkindly ſeaſons at the time of tranſplanting and dividing the roots would frequently endanger and injure, if not deſtroy the crops. But admitting the mode generally practicable, we very much doubt whether all the advantages he has enumerated would be derived from this mode of culture. Why ſhould dividing and tranſplanting the roots of wheat cauſe the crop to be early, or afford a *certainty* of its being *a good one?* We cannot think that *leſs manure* is neceſſary in this method, than either in drilling or broad-caſt; nor can we by any means admit, that ſuch crops would "be perfectly free from weeds without either hand or horſe-hoeing." We readily agree with Mr Bogle, that by this mode of culture on a general ſcale, an immenſe quantity of ſeed-corn would be annually ſaved to the nation; and in this we believe, the advantage, were it practicable, would principally conſiſt."

135 Further obſervations of Mr Bogle.

Upon the ſame ſubject, and that of harrowing all kinds of corn, we are informed, Mr Bogle afterwards communicated to the Society his thoughts more at large, together with authentic accounts which were made at his inſtance, and which were attended with very great ſucceſs. Theſe, however, were received too late for publication in the laſt (3d) volume of their papers. But the Society, conceiving his ſyſtem may be attended with conſiderable advantages if brought into general practice, have given, at the end of the volume, a few of his leading principles. Mr Bogle ſtates, 1. That he has known many inſtances of very great crops having been obtained by harrowing fields of corn after they were ſprouted; and therefore recommends the practice very warmly.

2. That he has alſo received an authentic account of one inſtance where the ſame good effects were produced by ploughing the field.

3. On the ſyſtem of tranſplanting, he ſtates, that a very great proportion of the ſeed will be ſaved, as a farmer may have a nurſery, or ſmall patch of plants, from which his fields may be ſupplied; he calculates that one acre will yield plants ſufficient for 100 acres.

4. That a very great increaſe of crops may be obtained by this method, probably a double crop, nay perhaps a triple quantity of what is reaped either by drilling, or by the broad-caſt huſbandry.

5. That a great part of the labour may be performed by infirm men and women, and alſo by children, who are at preſent ſupported by the pariſh charity; and that of courſe the poor' srates may be conſiderably reduced.

6. That the expence will not exceed from 20s. to 30s. per acre, if the work be performed by able-bodied men and women; but that it will be much lower, if that proportion of the work which may be done by employing young boys and girls ſhould be allotted to them.

7. That in general he has found the diſtance of nine inches every way a very proper diſtance for ſetting out the plants at; but recommends them to be tried at other ſpaces, ſuch as ſix, eight, or even 12 inches.

8. That he conceives an earlier crop may be obtained in this manner than can be obtained by any other mode of cultivation.

9. That a clean crop may alſo be procured in this way, becauſe if the land be ploughed immediately before the plants are ſet out, the corn will ſpring much quicker from the plants than the weeds will do from their ſeeds, and the corn will thereby bear down the growth of the weeds.

10. That ſuch lands as are overflowed in the winter and ſpring, and are of courſe unfit for ſowing with wheat in the autumn, may be rendered fit for crops of wheat by planting them in the ſpring, or even in the ſummer.

11. That he has known inſtances of wheat being tranſplanted in September, October, November, February, March, April, and even as late as the middle of May, which have all anſwered very well.

12. That he has known an early kind of wheat ſown as late as the middle of May, which has ripened in very good time; and from that circumſtance he conceives, if the plants ſhould be taken from that early kind, the ſeaſon of tranſplanting might be prolonged at leaſt till the 1ſt of July, perhaps even later.

13. That he has reaſon to think wheat, oats, and barley, are not annuals, but are perennials, provided they are eaten down by cattle and ſheep, or are kept low by the ſcythe or ſickle; and are prevented from ſpindling or coming to the ear.

14. That one very prevalent motive with him in proſecuting this plan, is, that he is of opinion it may enable government to deviſe means of ſupporting the vagrant poor, both old and young, who are now to be met with every where, both in towns and in the country, and who are at preſent a burden on the community: but if ſuch employment could be ſtruck out for them, a comfortable ſubſiſtence might be provided for them by means of their own labour and induſtry; and not only ſave the public and private charitable contributions, but may alſo render that claſs of people uſeful and profitable ſubjects; inſtead of their remaining in a uſeleſs, wretched, and perhaps a profligate and vicious courſe of life.

Laſtly, Mr Bogle has hinted at a ſecondary object which he has in view, from this mode of cultivation, which he apprehends may in time, with a ſmall degree of attention, prove extremely advantageous to agriculture.—It is, that in the firſt place, the real and intrinſic value of different kinds of grain may be more accurately aſcertained by making a compariſon of it with a few plants of each kind ſet out at the ſame time, than can be done when ſown in drills or broad-caſt; and when the moſt valuable kinds of wheat, oats, or barley, are diſcovered, he ſtates, that in a very ſhort time (not exceeding four or five years) a ſufficient quantity of that valuable kind may be procured to ſupply the kingdom with ſeed from a ſingle grain of each kind; for he calculates, that 47,000 grains of wheat may be produced by diviſibility in two years and three months.

136 Obſervations of the Bath Society.

Upon theſe propoſitions the ſociety obſerves, "That although Mr Bogle appears to be too ſanguine in his expectations of ſeeing his plan realized in *general practice*, it certainly merits the attention of Gentlemen Farmers. We wiſh them to make fair experiments, and report their ſucceſs. Every grand improvement has been, and ever will be progreſſive. They muſt neceſſarily originate with gentlemen; and thence the circle is extended by almoſt imperceptible degrees over provinces and countries. At all events, Mr Bogle is juſtly intitled to the thanks of the Society, and of the public, for the great attention he has paid to the ſubject."

2. OATS.

137 Effects of froſt upon tilled land.

As winter-ploughing enters into the culture of oats, we muſt remind the reader of the effects of froſt upon tilled land. Providence has neglected no region intended for the habitation of man. If in warm climates the ſoil be meliorated by the ſun, it is no leſs meliorated by froſt in cold climates. Froſt acts upon water, by expanding it into a larger ſpace. Froſt has no effect upon dry earth; witneſs ſand, upon which it makes no impreſſion. But upon wet earth it acts moſt vigorouſly: it expands the moiſture, which requiring more ſpace puts every particle of the earth out of its place, and ſeparates them from each other. In that view, froſt may be conſidered as a plough ſuperior to any that is made, or can be made by the hand of man: its action reaches the minuteſt particles; and by dividing and ſeparating them, it renders the ſoil looſe and friable. This operation is the moſt remarkable in tilled land, which gives free acceſs to froſt. With reſpect to clay-ſoil in particular, there is no rule in huſbandry more eſſential than to open it before winter in hopes of froſt. It is even adviſable in a clay-ſoil to leave the ſtubble rank; which, when ploughed in before winter, keeps the clay looſe, and admits the froſt into every cranny.

To apply this doctrine, it is dangerous to plough clay-ſoil when wet, becauſe water is a cement for clay, and binds it ſo as to render it unfit for vegetation. It is, however, leſs dangerous to plough wet clay before winter than after. A ſucceeding froſt corrects the bad effects of ſuch ploughing; a ſucceeding drought increaſes them.

138 Culture of oats.

The common method is, to ſow oats on new-ploughed land in the month of March, as ſoon as the ground is tolerably dry. If it continues wet all the month of March, it is too late to venture them after. It is much better to ſummer-fallow, and to ſow wheat in ahe autumn. But the preferable method, eſpecially in clay-ſoil, is to turn over the field after harveſt, and to lay it open to the influences of froſt and air, which leſſen the tenacity of clay, and reduce it to a free mould. The ſurface-ſoil by this means is finely mellowed for reception of the ſeed; and it would be a pity to bury it by a ſecond ploughing before ſowing. In general, the bulk of clay-ſoils are rich; and ſkilful ploughing without dung, will probably give a better crop, than unſkilful ploughing with dung.

Hitherto of natural clays. We muſt add a word of carſe-clays which are artificial, whether left by the ſea, or ſweeped down from higher grounds by rain. The method commonly uſed of dreſſing carſe-clay for oats, is, not to ſtir it till the ground be dry in the ſpring, which ſeldom happens before the firſt of March, and the ſeed is ſown as ſoon after as the ground is ſufficiently dry for its reception. Froſt has a ſtronger effect on ſuch clays than on natural clay. And if the field be laid open before winter, it is rendered ſo looſe by froſt as to be ſoon drenched in water. The particles at the ſame time are ſo ſmall, as that the firſt drought in ſpring makes the ſurface cake or cruſt. The difficulty of reducing this cruſt into mould for covering the oat-ſeed, has led farmers to delay ploughing till the month of March. But we are taught by experience, that this ſoil ploughed before winter, is ſooner dry than when the ploughing is delayed till ſpring; and as early ſowing is a great advantage, the objection of the ſuperficial cruſting is eaſily removed by the firſt harrow above deſcribed, which will produce abundance of mould for covering the ſeed. The ploughing before winter not only produces early ſowing, but has another advantage: the ſurface-ſoil that had been mellowed during winter by the ſun, froſt, and wind, is kept above.

The dreſſing a loamy ſoil for oats differs little from dreſſing a clay ſoil, except in the following particular, that being leſs hurt by rain, it requires not high ridges, and therefore ought to be ploughed crown and furrow alternately.

Where there is both clay and loam in a farm, it is obvious from what is ſaid above, that the ploughing of the clay after harveſt ought firſt to be diſpatched. If both cannot be overtaken that ſeaſon, the loam may be delayed till the ſpring with leſs hurt.

Next of a gravelly ſoil; which is the reverſe of clay, as it never ſuffers but from want of moiſture. Such a ſoil ought to have no ridges; but be ploughed circularly from the centre to the circumference, or from the circumference to the centre. It ought to be tilled after harveſt: and the firſt dry weather in ſpring ought to be laid hold of to ſow, harrow, and roll; which will preſerve it in ſap.

The culture of oats is the ſimpleſt of all. That grain is probably a native of Britain: it will grow on the worſt ſoil with very little preparation. For that reaſon, before turnip was introduced, it was always the firſt crop upon land broken up from a ſtate of nature.

Upon ſuch land, may it not be a good method, to build upon the crown of every ridge, in the form of a wall, all the ſurface-earth, one ſod above another, as in a fold for ſheep? After ſtanding in this form all the ſummer and winter, let the walls be thrown down, and the ground prepared for oats. This will ſecure one or two good crops; after which the land may be dunged for a crop of barley and graſs-ſeeds. This method may anſwer in a farm where manure is ſcanty.

3. Barley.

139 Culture of barley.

This is a culmiferous plant that requires a mellow ſoil. Upon that account, extraordinary care is requiſite where it is to be ſown in clay. The land ought to be ſtirred immediately after the foregoing crop is removed, which lays it open to be mellowed with the froſt and air.

140 Ribbing.

In that view, a peculiar ſort of ploughing has been introduced, termed *ribbing*; by which the greateſt quantity of ſurface poſſible is expoſed to the air and froſt. The obvious objection to this method is, that half of the ridge is left unmoved. And to obviate that objection, the following method is offered, which moves the whole ſoil, and at the ſame time expoſes the ſame quantity of ſurface to the froſt and air.

141 A better method.

As ſoon as the former crop is off the field, let the ridges be gathered with as deep a furrow as the ſoil will admit, beginning at the crown and ending at the furrows. This ploughing looſens the whole ſoil, giving free acceſs to the air and froſt. Soon after, begin a ſecond ploughing in the following manner. Let the field be divided by parallel lines croſs the ridges, with intervals of 30 feet or ſo. Plough once round an interval, beginning at the edges, and turning the earth toward the middle of the interval; which covers a foot or ſo of the ground formerly plowed. Within that foot plough another round ſimilar to the former; and after that, other rounds, till the whole interval be finiſhed, ending at the middle. Inſtead of beginning at the edges, and ploughing toward the middle, it will have the ſame effect to begin at the middle and to plough toward the edges. Plough the other intervals in the ſame manner. As by this operation the furrows of the ridges will be pretty much filled up, let them be cleared and water-furrowed without delay. By this method, the field will be left waving like a plot in a kitchen-garden, ridged up for winter. In this form, the field is kept perfectly dry; for beſide the capital furrows that ſeparate the ridges, every ridge has a number of croſs furrows that carry the rain inſtantly to the capital furrows. In hanging grounds retentive of moiſture, the parallel lines above-mentioned ought not to be perpendicular to the furrows of the ridges, but to be directed a little downward, in order to carry rain-water the more haſtily to theſe furrows. If the ground be clean, it may lie in that ſtate winter and ſpring, till the time of ſeed-furrowing. If weeds happen to riſe, they muſt be deſtroyed by ploughing, or breaking, or both; for there cannot be worſe huſbandry, than to put ſeed into dirty ground.

142 Advantages of this method.

This method reſembles common ribbing in appearance, but is very different in reality. As the common ribbing is not preceded by a gathering furrow, the half of the field is left untilled, compact as when the former crop was removed, impervious in a great meaſure to air or froſt. The common ribbing at the ſame time lodges the rain-water on every ridge, preventing it from deſcending to the furrows; which is hurtful in all ſoils, and poiſonous in a clay ſoil. The *ſlitching* here deſcribed, or *ribbing*, if you pleaſe to call it ſo, prevents theſe noxious effects. By the two ploughings the whole ſoil is opened, admitting freely air and froſt; and the multitude of furrows lays the ſurface perfectly dry, giving an early opportunity for the barley-ſeed.—But further, as to the advantage of this method: When it is proper to ſow the ſeed, all is laid flat with the brake, which is an eaſy operation upon the ſoil that is dry and pulverized; and the ſeed-furrow which ſucceeds, is ſo ſhallow as to bury little or none of the ſurface-earth; whereas the ſtirring for barley is commonly done with the deepeſt furrow; and conſequently buries all the ſurface-ſoil that was mellowed by the froſt and air. Nor is this method more expenſive; becauſe the common ribbing muſt always be followed with a ſtirring furrow, which is ſaved in the method recommended. Nay, it is leſs expenſive; for after common ribbing, which keeps in the rain water, the ground is commonly ſo ſoured, as to make the ſtirring a laborious work.

143 Management of ſeed in a dry ſeaſon.

It is well known that barley is leſs valuable when it does not ripen equally; and that barley which comes up ſpeedily in a duſky ſoil, muſt gain a great advantage over ſeed-weeds. Therefore, firſt take out about one-third of the contents of the ſacks of ſeed-barley or bear, to allow for the ſwelling of the grain. Lay the ſacks with the grain to ſteep in clean water; let it lie covered with it for at leaſt 24 hours. When the ground is ſo dry as at preſent, and no likelihood of rain for 10 days, it is better to lie 36 hours. Sow the grain wet from ſteeping, without any addition of powdered quick-lime, which, though often recommended in print, can only poiſon the ſeed, ſuck up part of its uſeful moiſture, and burn the hands of the ſower. The ſeed will ſcatter well, as clean water has no tenacity; only the ſower muſt put in a fourth or a third more ſeed in bulk than uſual of dry grain, as the grain is ſwelled in that proportion: harrow it in as quickly as poſſible after it is ſown; and though not neceſſary, give it the benefit of freſh furrow, if convenient. You may expect it up in a fortnight at fartheſt.

The following experiment by a correſpondent of the Bath Society being conſidered as a very intereſting one, is here ſubjoined.

144 Important experiments on feed-barley.

"The laſt ſpring, (1783) being remarkably dry, I ſoaked my ſeed-barley in the black water taken from a reſervoir which conſtantly receives the draining of my dung-heap and ſtables. As the light corn floated on the top, I ſkimmed it off, and let the reſt ſtand 24 hours. On taking it from the water, I mixed the ſeed grain with a ſufficient quantity of ſifted wood-aſhes, to make it ſpread regularly, and ſowed three fields with it. I began ſowing the 16th, and finiſhed the 23d of April. The produce was 60 buſhels per acre, of good clean barley, without any *ſmall* or *green* corn, or weeds at harveſt. No perſon in this country had better grain.

"I ſowed alſo ſeveral other fields with the ſame ſeed dry, and without any preparation; but the crop, like thoſe of my neighbours, was very poor; not more than twenty buſhels per acre, and much mixed with *green* corn and weeds when harveſted. I alſo ſowed ſome of the ſeed dry on one ridge in each of my former fields, but the produce was very poor in compariſon of the other parts of the field."

Where the land is in good order, and free of weeds, 145 Time of ſowing.

April is the month for ſowing barley. Every day is proper, from the firſt to the laſt.

The dreſſing loamy ſoil and light ſoil for barley, is the ſame with that deſcribed; only that to plough dry is not altogether ſo eſſential as in dreſſing clay-ſoil. Loam or ſand may be ſtirred a little moiſt: better, however, delay a week or two, than to ſtir a loam when moiſt. Clay muſt never be ploughed moiſt, even tho' the ſeaſon ſhould eſcape altogether. But this will ſeldom be neceſſary; for not in one year out of 20 will it happen, but that clay is dry enough for ploughing ſome time in May. Froſt may correct clay ploughed wet after harveſt; but ploughed wet in the ſpring, it unites into a hard maſs, not to be diſſolved but by very hard labour.

On the cultivation of this grain we have the following obſervations by a Norfolk farmer.

146 Miſcellaneous obſervations concerning the cultivation of barley.

The beſt ſoil, he obſerves, is that which is dry and healthy, rather light than ſtiff, but yet of ſufficient tenacity and ſtrength to retain the moiſture. On this kind of land the grain is always the beſt bodied and coloured, the nimbleſt in the hand, and has the thinneſt rind. Theſe are qualities which recommend it moſt to the maltſter. If the land is poor, it ſhould be dry and warm; and when ſo, it will often bear better corn than richer land in a cold and wet ſituation.

In the choice of your ſeed, it is needful to obſerve, that the beſt is of a pale lively colour, and brightiſh caſt, without any deep redneſs or black tinge at the tail. If the rind be a little ſhrivelled, it is the better; for that ſlight ſhrivelling proves it to have a thin ſkin, and to have ſweated in the mow. The neceſſity of a change of ſeed by not ſowing two years together what grew on the ſame ſoil, is not in any part of huſbandry more evident than in the culture of this grain, which, if not frequently changed, will grow coarſer and coarſer every ſucceeding year.

It has generally been thought that ſeed-barley would be benefited by ſteeping; but liming it has, in many inſtances, been found prejudicial. Sprinkling a little ſoot with the water in which it is ſteeped has been of great ſervice, as it will ſecure the ſeed from inſects. In a very dry ſeed-time, barley that has been wetted for malting, and begins to ſprout, will come up ſooner, and produce as good a crop as any other.

If you ſow after a fallow, plough three times at leaſt. At the firſt ploughing, lay your land up in ſmall ridges, and let it remain ſo during the winter, for the froſt to mellow it; the ſecond ploughing ſhould be the beginning of February. In March ſplit the ridges, and lay the land as flat as poſſible, at the ſame time harrowing it fine. But in ſtrong wet lands (if you have no other for barley) lay it round, and make deep furrows to receive the water.

“ I have often (continues he), taken the following method with ſucceſs: On lands tolerably manured, I ſowed clover with my barley, which I reaped at harveſt; and fed the clover all the following winter, and from ſpring to July, when I fallowed it till the following ſpring, and then ſowed it with barley and clover as before. Repeating this method every year, I had very large crops, but would not recommend this practice on poor light land.

“ We ſow on our lighteſt lands in April, on our moiſt lands in May; finding that thoſe lands which are the moſt ſubject to weeds produce the beſt crops when ſown late.

“ The common method is to ſow the barley-ſeed broad-caſt at two ſowings; the firſt harrowed in once, the ſecond twice; the uſual allowance from three to four buſhels per acre. But if farmers could be prevailed on to alter this practice, they would ſoon find their account in it. Were only half the quantity ſown equally, the produce would be greater, and the corn leſs liable to lodge: For when corn ſtands very cloſe, the ſtalks are drawn up weak; and on that account are leſs capable of reſiſting the force of winds, or ſupporting themſelves under heavy rains.

“ From our great ſucceſs in ſetting and drilling wheat, ſome of our farmers tried theſe methods with barley; but did not find it anſwer their expectations, except on very rich land.

“ I have myſelf had 80 ſtalks on one root of barley, which all produced good and long ears, and the grain was better than any other; but the method is too expenſive for general practice. In poor land, ſow thin, or your crop will be worth little. Farmers who do not reaſon on the matter, will be of a different opinion; but the fact is indiſputable.”

When the barley is ſowed and harrowed in, he adviſes that the land be rolled after the firſt ſhower of rain, to break the clods. This will cloſe the earth about the roots, which will be a great advantage to it in dry weather.

When the barley has been up three weeks or a month, it is a very good way to roll it again with a heavy roller, which will prevent the ſun and air from penetrating the ground to the injury of the roots. This rolling, before it branches out, will alſo cauſe it to tiller into a greater number of ſtalks: ſo that if the plants be thin, the ground will be thereby filled, and the ſtalks ſtrengthened.

If the blade grows too rank, as it ſometimes will in a warm wet ſpring, mowing is a much better method than feeding it down with ſheep; becauſe the ſcythe takes off only the rank tops, but the ſheep being fond of the ſweet end of the ſtalk next the root, will often bite ſo cloſe as to injure its future growth.

4. BUCK-WHEAT.

147 Culture Buck-wheat.

THE uſes of this plant have been mentioned in the preceding part N° 46. It delights in a mellow ſandy ſoil; but ſucceeds well in any dry looſe healthy land, and moderately ſo in a free loamy ſtone-braſh. A ſtiff clay is its averſion, and it is entirely labour loſt to ſow it in wet poachy ground. The proper ſeaſon for ſowing is from the laſt week of May or the beginning of June. It has been ſown, however, ſo early as the beginning of April, and ſo late as the 22d of July, by way of experiment; but the latter was rather extreme to be choſen, and the former was in danger from froſt. In an experiment upon a ſmall piece of ground, the grain of two different crops was brought to maturity in the ſummer 1787.—After ſpring feedings, a crop of turnip-rooted cabbage, or vetches, there will be ſufficient time to ſow the land with buck-wheat. Probably, in hot dry ſummers, a crop of vetches might even be mown for hay early enough to introduce a crop of this grain after it.

In the year 1780, about ſeven acres of a ſandy ſoil on Briſlington Common (A), having been firſt tolerably well cleanſed from brambles, furze, &c. received one ploughing. To reduce the irregularities of the ſurface, it was rolled ; and on the 9th of June in that year, two buſhels and a half of buck-wheat per acre ſown, the ground rolled again without harrowing.

148 Advantages of this cropping. The vegetation appeared in five or ſix days, as is conſtantly the caſe, be the weather wet or dry. The growth was ſo rapid, that the fern, with which this land greatly abounded, was completely kept under. About the middle of September the crop was mown, but by reaſon of a great deal of rain about that time, it was not ſecured until the beginning of October ; hence a loſs of great part of the grain by ſhedding, as well as ſome eaten by birds. However, there were ſaved about 24 Wincheſter buſhels per acre ; and, notwithſtanding its long expoſure to the weather, received no ſort of damage, only perhaps that the fineſt and moſt perfect grain was the firſt to fall from the plant. The ground after this had almoſt the appearance of a fallow, and was immediately ploughed.

When it had lain a moderate time to meliorate, and to receive the influences of the atmoſphere, it was harrowed, ſowed with Lammas wheat, and ploughed in under furrow, in a contrary direction to the firſt ploughing. Thus, a piece of land, which in the month of April was altogether in a ſtate of nature, in the following November was ſeen under a promiſing crop of what is well ſtyled the king of grain, and this without the aid of manure, or of any very great degree of tillage. Nor was the harveſt by any means deficient; for ſeveral perſons converſant in ſuch things eſtimated the produce from 26 to 30 buſhels per acre. As ſoon as the wheat crop was taken off, the ground had one ploughing, and on the firſt of September following was ſown with turnip-ſeed. The turnips were not large, but of an herbage ſo abundant as in the following ſpring to ſupport 120 ewes with their lambs, which were fed on it by folding four weeks. After this it was manured with a compoſition of rotten dung and natural earth, about 20 putt loads per acre, and planted with potatoes. The crop ſold for L. 138, beſides a conſiderable number uſed in the family, and a quantity reſerved, with which ten acres were planted the following ſeaſon. The enſuing autumn it was again ſown with wheat, and produced an excellent crop. In the ſpring of 1784, it was manured and planted with potatoes, as in the preceding inſtance ; the crop (tho' tolerably good) by no means equal to the former, producing about 100 ſacks per acre only. In ſpring 1785, the land was now for a third time under a crop of wheat, it being intended to try how far this mode of alternate cropping, one year with potatoes and another with wheat, may be carried.

From the ſucceſs of the preceding and other experiments, by Nehemiah Bartley, Eſq; of Briſtol, as detailed in the Bath Society Papers, it would ſeem, that the culture of this plant ought in many caſes to be adopted inſtead of a ſummer-fallowing : for the crop produced appears not only to be ſo much clear gain in reſpect to ſuch practice, but alſo affords a conſiderable quantity of ſtraw for fodder and manure ; beſide that a ſummer-fallowing is far from being ſo advantageous a preparation for a ſucceeding crop.

5. BEANS.

149 Culture of beans. THE propereſt ſoil for beans is a deep and moiſt clay.

There was lately introduced into Scotland a method of ſowing beans with a drill-plough, and horſe-hoeing the intervals ; which, beſide affording a good crop, is a dreſſing to the ground. But as that method is far from being general, we keep in the common track.

As this grain is early ſown, the ground intended for it ſhould be ploughed before winter, to give acceſs to the froſt and air ; beneficial in all ſoils, and neceſſary in a clay ſoil. Take the firſt opportunity after January, when the ground is dry, to looſen the ſoil with the harrow firſt deſcribed, till a mould be brought upon it. Sow the ſeed, and cover it with the ſecond harrow. The third will ſmooth the ſurface, and cover the ſeed equally. Theſe harrows make the very beſt figure in ſowing beans ; which ought to be laid deep in the ground, not leſs than ſix inches. In clay ſoil, the common harrows are altogether inſufficient. The ſoil, which has reſted long after ploughing, is rendered compact and ſolid : the common harrows ſkim the ſurface : the ſeed is not covered ; and the firſt hearty ſhower of rain lays it above ground. Where the farmer overtakes not the ploughing after harveſt, and is reduced to plough immediately before ſowing, the plough anſwers the purpoſe of the firſt harrow ; and the other two will complete the work. But the labour of the firſt harrow is ill ſaved ; as the ploughing before winter is a fine preparation, not only for beans, but for grain of every kind. If the ground ploughed before winter happen by ſuperfluity of moiſture to cake, the firſt harrow going along the ridges, and croſſing them, will looſen the ſurface, and give acceſs to the air for drying. As ſoon as the ground is dry, ſow without delaying a moment. If rain happen in the interim, there is no remedy but patience till a dry day or two come.

Carſe-clay, ploughed before winter, ſeldom fails to cake. Upon that account, a ſecond ploughing is neceſſary before ſowing ; which ought to be performed with an ebb furrow, in order to keep the froſt-mould as near the ſurface as poſſible. To cover the ſeed with the plough is expreſſed by the phraſe *to ſow under furrow*. The clods raiſed in this ploughing are a ſort of ſhelter to the young plants in the chilly ſpring-months.

The foregoing method will anſwer for loam. And as for a ſandy or gravelly ſoil, it is altogether improper for beans.

Though we cannot approve the horſe-hoeing of beans, with the intervals that are commonly allotted for turnip, yet we would ſtrongly recommmend the drilling them at the diſtance of 10 or 12 inches, and keeping the intervals clean of weeds. This may be done by hand-hoeing, taking opportunity at the ſame time to lay freſh ſoil to the roots of the plants. But as this is an expenſive operation, and hands are not always to be got, a narrow plough, drawn by a ſingle horſe, might be uſed, with a mould-board on each ſide to ſcatter the earth

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(A) A very rough piece of land, at that time juſt incloſed.

earth upon the roots of the plants. This is a cheap and expeditious method: it keeps the ground clean; and nouriſhes the plants with freſh ſoil.

As beans delight in a moiſt ſoil, and have no end of growing in a moiſt ſeaſon, they cover the ground totally when ſown broad-caſt, keep in the dew, and exclude the ſun and air: the plants grow to a great height; but carry little ſeed, and that little not well ripened. This diſplays the advantage of drilling; which gives free acceſs to the ſun and air, dries the ground, and affords plenty of ripe ſeed.

6. PEASE.

150 Culture of peaſe. PEASE are of two kinds; the white, and the gray. The cultivation of the latter only belongs to this place.

There are two ſpecies of the gray kind, diſtinguiſhed by their time of ripening. One ripens ſoon, and for that reaſon is termed *hot ſeed:* the other, which is ſlower in ripening, is termed *cold ſeed.*

Peaſe, a leguminous crop, is proper to intervene between two culmiferous crops; leſs for the profit of a peaſe-crop, than for meliorating the ground. Peaſe, however, in a dry ſeaſon, will produce ſix or ſeven bolls each acre; but, in an ordinary ſeaſon, they ſeldom reach above two, or two and a half. Hence, in a moiſt climate, red clover ſeems a more beneficial crop than peaſe; as it makes as good winter-food as peaſe, and can be cut green thrice during ſummer.

A field intended for cold ſeed ought to be ploughed in October or November; and in February, as ſoon as the ground is dry, the ſeed ought to be ſown on the winter-furrow. A field intended for hot ſeed ought to be ploughed in March or April, immediately before ſowing. But if infeſted with weeds, it ought to be alſo ploughed in October or November.

Peaſe laid a foot below the ſurface will vegetate; but the moſt approved depth is ſix inches in light ſoil, and four inches in clay ſoil; for which reaſon, they ought to be ſown under furrow when the ploughing is delayed till ſpring. Of all grain, beans excepted, they are the leaſt in danger of being buried.

Peaſe differ from beans, in loving a dry ſoil and a dry ſeaſon. Horſe-hoeing would be a great benefit, could it be performed to any advantage; but peaſe grow expeditiouſly, and ſoon fall over and cover the ground, which bars ploughing. Horſe-hoeing has little effect when the plants are new ſprung; and when they are advanced to be benefited by that culture, their length prevents it. Faſt growing at the ſame time is the cauſe of their carrying ſo little ſeed: the ſeed is buried among the leaves; and the ſun cannot penetrate to make it grow and ripen. The only practicable remedy to obtain grain, is thin ſowing; but thick ſowing produces more ſtraw, and mellows the ground more. Half a boll for an Engliſh acre may be reckoned thin ſowing; three firlots, thick ſowing.

Notwithſtanding what is ſaid above, Mr Hunter, a noted farmer in Berwickſhire, began ſome time ago to ſow all his peaſe in drills; and never failed to have great crops of corn as well as of ſtraw. He ſowed double rows at a foot interval, and two feet and a half between the double rows, which admit horſe-hoeing. By that method, he had alſo good crops of beans on light land.

Peaſe and beans mixed are often ſown together, in order to catch different ſeaſons. In a moiſt ſeaſon, the beans make a good crop; in a dry ſeaſon, the peaſe.

The growth of plants is commonly checked by drought in the month of July; but promoted by rain in Auguſt. In July, graſs is parched; in Auguſt, it recovers verdure. Where peaſe are ſo far advanced in the dry ſeaſon as that the ſeed begins to form, their growth is indeed checked, but the ſeed continues to fill. If only in the bloſſom at that ſeaſon, their growth is checked a little; but they become vigorous again in Auguſt, and continue growing without filling till ſtopped by froſt. Hence it is, that cold ſeed, which is early ſown, has the beſt chance to produce corn: hot ſeed, which is late ſown, has the beſt chance to produce ſtraw.

The following method is practiſed in Norfolk, for ſowing peaſe upon a dry light ſoil, immediately opened from paſture. The ground is pared with a plough extremely thin, and every ſod is laid exactly on its back. In every ſod a double row of holes is made. A pea dropt in every hole lodges in the flay'd ground immediately below the ſod, thruſts its roots horizontally, and has ſufficient moiſture. This method enabled Norfolk farmers, in the barren year 1740, to furniſh white peaſe at 12s. per boll.

II. Plants cultivated for Roots. [*See alſo Art. III.*]

1. TURNIP.

151 Culture of turnip. TURNIP delights in a gravelly ſoil; and there it can be raiſed to the greateſt perfection, and with the leaſt hazard of miſcarrying. At the ſame time, there is no ſoil but will bear turnip when well prepared.

No perſon ever deſerved better of a country, than he who firſt cultivated turnip in the field. No plant is better fitted for the climate of Britain, no plant proſpers better in the coldeſt part of it, and no plant contributes more to fertility. In a word, there has not for two centuries been introduced into Britain a more valuable improvement.

Of all roots, turnip requires the fineſt mould; and to that end, of all harrows froſt is the beſt. In order to give acceſs to froſt, the land ought to be prepared by ribbing after harveſt, as above directed in preparing land for barley. If the field be not ſubject to annuals, it may lie in that ſtate till the end of May; otherwiſe the weeds muſt be deſtroyed by a brakeing about the middle of April; and again in May, if weeds riſe. The firſt week of June, plough the field with a ſhallow furrow. Lime it if requiſite, and harrow the lime into the ſoil. Draw ſingle furrows with intervals of three feet, and lay dung in the furrows. Cover the dung ſufficiently, by going round it with the plough, and forming the three-feet ſpaces into ridges. The dung comes thus to lie below the crown of every ridge.

152 Seaſon an method o ſowing. The ſeaſon of ſowing muſt be regulated by the time intended for feeding. Where intended for feeding in November, December, January, and February, the ſeed ought to be ſown from the 1ſt to the 20th of June. Where the feeding is intended to be carried on to March, April, and May, the ſeed muſt not be ſown till the end of July. Turnip ſown earlier than above directed, flowers that very ſummer, and runs faſt to ſeed; which renders it in a good meaſure unfit for

food. If ſown much later, it does not apple, and there is no food but from the leaves.

Though by a drill-plough the ſeed may be ſown of any thickneſs, the ſafeſt way is to ſow thick. Thin ſowing is liable to many accidents, which are far from being counterbalanced by the expence that is ſaved in thinning. Thick-ſowing can bear the ravage of the black fly, and leave a ſufficient crop behind. It is a protection againſt drought, gives the plants a rapid progreſs, and eſtabliſhes them in the ground before it is neceſſary to thin them.

The ſowing turnip broad caſt is univerſal in England, and common in Scotland, though a barbarous practice. The eminent advantage of turnip is, that beſide a profitable crop, it makes a moſt complete fallow; and the latter cannot be obtained but by horſe-hoeing. Upon that account, the ſowing turnip in rows at three feet diſtance is recommended. Wider rows anſwer no profitable end, ſtraiter rows afford not room for a horſe to walk in. When the turnip is about four inches high, annual weeds will appear. Go round every interval with the ſlighteſt furrow poſſible, at the diſtance of two inches from each row, moving the earth from the rows toward the middle of the interval. A thin plate of iron muſt be fixed on the left ſide of the plough, to prevent the earth from falling back and burying the turnip. Next, let women be employed to weed the rows with their fingers; which is better, and cheaper done, than with the hand-hoe. The hand-hoe, beſide, is apt to diſturb the roots of the turnip that are to ſtand, and to leave them open to drought by removing the earth from them. The ſtanding turnip are to be at the diſtance of twelve inches from each other: a greater diſtance makes them ſwell too much; a leſs diſtance affords them not ſufficient room. A woman ſoon comes to be expert in finger-weeding. The following hint may be neceſſary to a learner. To ſecure the turnip that is to ſtand, let her cover it with the left hand; and with the right pull up the turnip on both ſides. After thus freeing the ſtanding turnip, ſhe may ſafely uſe both hands. Let the field remain in this ſtate till the appearance of new annuals make a ſecond ploughing neceſſary; which muſt be in the ſame furrow with the former, but a little deeper. As in this ploughing the iron plate is to be removed, part of the looſe earth will fall back on the roots of the plants: the reſt will fill the middle of the interval, and bury every weed. When weeds begin again to appear, then is the time for a third ploughing in an oppoſite direction, which lays the earth to the roots of the plants. This ploughing may be about the middle of Auguſt; after which, weeds riſe very faintly. If they do riſe, another ploughing will clear the ground of them. Weeds that at this time riſe in the row, may be cleared with a hand-hoe, which can do little miſchief among plants diſtant twelve inches from each other. It is certain, however, that it may be done cheaper with the hand (A). And after the leaves of turnips in a row meet together, the hand is the only inſtrument that can be applied for weeding.

In ſwampy ground, the ſurface of which is beſt reduced by paring and burning, the ſeed may be ſown in rows with intervals of a foot. To ſave time, a drill plough may be uſed that ſows three or four rows at once. Hand-hoeing is proper for ſuch ground; becauſe the ſoil under the burnt *ſtratum* is commonly full of roots, which digeſt and rot better under ground than when brought to the ſurface by the plough. In the mean time, while theſe are digeſting, the aſhes will ſecure a good crop.

153 Properties of different ſorts of turnip.

In cultivating turnips to advantage, great care ſhould be taken to procure good, bright, nimble, and well-dried ſeed, and of the beſt kinds.

The Norfolk farmers generally raiſe the oval white, large green-topp'd, and the red or purple-topp'd kinds, which from long experience they have found to be the moſt profitable.

The roots of the green-topp'd will grow to a large ſize, and continue good much longer than others. The red or purple-topp'd will alſo grow large, and continue good to the beginning of February; but the roots become hard and ſtringy ſooner than the former.

The green-topp'd growing more above ground, is in more danger of ſuſtaining injury from ſevere froſts than the red or purple, which are more than half covered by the ſoil; but it is the ſofteſt and ſweeteſt, when grown large, of any kind. We have ſeen them brought to table a foot in diameter, and equally good as garden turnips.

Turnips delight in a light ſoil, conſiſting of ſand and loam mixed; for when the ſoil is rich and heavy, although the crop may be as great in weight, they will be rank, and run to flower earlier in ſpring.

154 Obſervations with regard to feed.

Turnip-ſeed, like that of grain, will not do well without frequent changing. The Norfolk ſeed is ſent to moſt parts of the kingdom, and even to Ireland, but after two years it degenerates; ſo that thoſe who wiſh to have turnips in perfection ſhould procure it freſh every year from Norwich, and they will find their account in ſo doing. For from its known reputation, many of the London ſeedmen ſell, under that character, ſeed raiſed in the vicinity of the metropolis, which is much inferior in quality.

When the plants have got five leaves, they ſhould be hoed, and ſet out at leaſt ſix inches apart. A month afterward, or earlier if it be a wet ſeaſon, a ſecond hoeing ſhould take place, and the plants be left at leaſt 14 inches diſtant from each other, eſpecially if intended for feeding cattle; for where the plants are left thicker, they will be proportionably ſmaller, unleſs the land is very rich indeed.

155 Methods of culture in Norfolk.

Some of the beſt Norfolk farmers ſow turnips in drills three feet aſunder, and at a ſecond hoeing leave them a foot apart in the rows. By this means the trouble and expence of hoeing is much leſſened, and the crop of equal weight as when ſown in the com-

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(A) Children under thirteen may be employed to weed turnip with the fingers. We have ſeen them go on in that work with alacrity; and a ſmall premium will have a good effect. For boys and girls above thirteen, a hand-hoe adapted to their ſize is an excellent inſtrument: it ſtrengthens the arms amazingly. In driving the plough, the legs only are exerciſed; but as the arms are chiefly employed in huſbandry, they ought to be prepared beforehand by gentle exerciſe.

mon method. The intervals may eaſily be cleared of weeds by the horſe-hoe.

Great quantities of turnips are raiſed in Norfolk every year for feeding black cattle, which turn to great advantage.

156 Value as food for cattle.

It is well known, that an acre of land contains 4840 ſquare yards, or 43,560 ſquare feet ; ſuppoſe then that every ſquare foot contains one turnip, and that they weigh only two pounds each on an average, here will be a maſs of food excellent in kind, of 46 tons per acre, often worth from four to five guineas, and ſometimes more.

Extraordinary crops of barley frequently ſucceed turnips, eſpecially when fed off the land. In feeding them off, the cattle ſhould not be ſuffered to run over too much of the ground at once, for in that caſe they will tread down and ſpoil twice as many as they eat. In Norfolk, they are confined by herdles to as much as is ſufficient for them for one day. By this mode the crop is eaten clean, the ſoil is equally trodden, which if light, is of much ſervice, and equally manured by the cattle.

A notion prevails in many places, that mutton fattened with turnips is thereby rendered rank and ill-taſted; but this is a vulgar error. The beſt mutton in Norfolk (and few counties have better) is all fed with turnips. It is rank paſtures, and marſhy lands, that produce rank mutton.

If the land be wet and ſpringy, the beſt method is to draw and carry off your turnips to ſome dry paſture ; for the treading of the cattle will not only injure the crop, but render the land ſo ſtiff, that you muſt be at an additional expence in ploughing.

157 Method of preſerving turnips.

To preſerve turnips for late ſpring feed, the beſt method, and which has been tried with ſucceſs by ſome of the beſt Engliſh farmers, is, To ſtack them up in dry ſtraw; a load of which is ſufficient to preſerve 40 tons of turnips. The method is eaſy, and as follows :—

After drawing your turnips in February, cut off the tops and tap roots, (which may be given to ſheep), and let them lay a few days in the field, as no weather will then hurt them.

Then, on a layer of ſtraw next the ground, place a layer of turnips two feet thick ; and then another layer of ſtraw, and ſo on alternately, till you have brought the heap to a point. Care muſt be taken to turn up the edges of the layers of ſtraw, to prevent the turnips from rolling out ; cover the top well with long ſtraw, and it will ſerve as a thatch for the whole.

In this method, as the ſtraw imbibes the moiſture exhaled from the roots, all vegetation will be prevented, and the turnips will be nearly as good in May as when firſt drawn from the field. If ſtraw be ſcarce, old haulm or ſtubble will anſwer the ſame purpoſe.

But to prevent this trouble and expence, perhaps farmers in all countries would find it moſt to their intereſt to adopt the method uſed by theNorfolk farmers, which is, to continue ſowing turnips to the latter end of Auguſt ; by which means their late crops remain good in the field till the latter end of April, and often till the middle of May.

The advantages of having turnips good till the ſpring feed is generally ready, are ſo obvious and ſo great, that many of the moſt intelligent farmers (although at firſt prejudiced againſt the practice) are now come into it, and find their account in ſo doing.

I. POTATOES.

158 General culture.

THE choice of ſoil is not of greater importance in any other plant than in a potato. This plant in clay ſoil, or in rank black loam lying low without ventilation, never makes palatable food. In a gravelly or ſandy ſoil, expoſed to the ſun and to free air, it thrives to perfection, and has a good reliſh. But a rank black loam, though improper to raiſe potatoes for the table, produces them in great plenty ; and the product is, as already obſerved, a palatable food for horned cattle, hogs, and poultry.

The ſpade is a proper inſtrument for raiſing a ſmall quantity, or for preparing corners or other places inacceſſible to the plough ; but for raiſing potatoes in quantities, the plough is the only inſtrument.

As two great advantages of a drilled crop are, to deſtroy weeds, and to have a fallow at the ſame time with the crop, no judicious farmer will think of raiſing potatoes in any other way. In September or October, as ſoon as that year's crop is removed, let the field have a rouſing furrow, a croſs-brakeing next, and then be cleared of weeds by the cleaning harrow. Form it into three-feet ridges, in that ſtate to lie till April, which is the proper time for planting potatoes. Croſs-brake it, to raiſe the furrows a little. Then lay well-digeſted horſe-dung along the furrows, upon which lay the roots at eight inches diſtance. Cover up the roots with the plough, going once round every row. This makes a warm bed for the potatoes ; hot dung below, and a looſe covering above, that admits every ray of the ſun. As ſoon as the plants appear above ground, go round every row a ſecond time with the plough, which will lay upon the plants an additional inch or two of mould, and at the ſame time bury all the annuals ; and this will complete the ploughing of the ridges. When the potatoes are ſix inches high, the plough, with the deepeſt furrow, muſt go twice along the middle of each interval in oppoſite directions, laying earth firſt to one row, and next to the other. And to perform this work, a plough with a double mould-board will be more expeditious. But as the earth cannot be laid cloſe to the roots by the plough, the ſpade muſt ſucceed, with which four inches of the plants muſt be covered, leaving little more but the tops above ground ; and this operation will at the ſame time bury all the weeds that have ſprung ſince the former ploughing. What weeds ariſe after muſt be pulled up with the hand. A hoe is never to be uſed here : it cannot go ſo deep as to deſtroy the weeds without cutting the fibres of the plants ; and if it ſkim the ſurface, it only cuts off the heads of the weeds, and does not prevent their puſhing again.

159 Particular methods.

In the Bath Society Papers, we have the following practical obſervations on the culture and uſe of potatoes, given as the reſult of various experiments made for five years ſucceſſively on that valuable root, the growth of which cannot be too much encouraged.

When the potato crop is the only object in view, the following method is the moſt eligible.

The land being well pulverized by two or three good harrowings and ploughings, is then manured with 15 or 20 cart-loads of dung per acre, before it receives its laſt earth. Then it is thrown on to what the Suffolk farmers call the *Trench balk*, which is narrow and deep ridge-work, about 15 inches from the centre of one ridge to the centre of the other. Women and children drop the ſets in the bottom of every furrow 15 inches apart; men follow, and cover them with large hoes, a foot in width, pulling the mould down ſo as to bury the ſets five inches deep; they muſt receive two or three hand-hoeings, and be kept free from weeds; always obſerving to draw the earth as much as poſſible to the ſtems of the young plants. By repeated trials, the firſt or ſecond week in April is found the moſt advantageous time for planting.

In the end of September or the beginning of October, when the haulm becomes withered, they ſhould be ploughed up with a ſtrong double-breaſted plough. The workman muſt be cautioned to ſet his plough very deep, that he may ſtrike below all the potatoes, to avoid damaging the crop. The women who pick them up, if not carefully attended to, will leave many in the ground, which will prove detrimental to any ſucceeding corn, whether wheat or barley. To avoid which inconvenience, let the land be harrowed, and turn the ſwine in to glean the few that may be left by their negligence.

By this method, the ſets will be 15 ſquare inches from each other; it will take 18 buſhels to plant an acre; and the produce, if on a good mixed loamy ſoil, will amount to 300 buſhels.

If the potatoes are grown as a preparation for wheat, it is preferable to have the rows two feet two inches from each other, hand-hoeing only the ſpace from plant to plant in each row; then turning a ſmall furrow from the inſide of each row by a common light plough, and afterwards with a double-breaſted plough with one horſe, ſplit the ridge formed by the firſt ploughing thoroughly to clean the intervals. This work ſhould not be done too deep the firſt time, to avoid burying the tender plants; but the laſt earth ſhould be ploughed as deep as poſſible; and the cloſer the mould is thrown to the ſtems of the plants, the more advantageous it will prove. Thus 15 buſhels will plant an acre, and the produce will be about 300 buſhels; but the land, by the ſummer ploughings, will be prepared to receive ſeed-wheat immediately, and almoſt enſure a plentiful crop.

160
To prevent the grub.

The potato-ſets ſhould be cut a week before planting, with one or two eyes to each, and the pieces not very ſmall; two buſhels of freſh ſlaked lime ſhould be ſown over the ſurface of the land as ſoon as planted, which will effectually prevent the attacks of the grub.

The expence attending an acre of potatoes well cultivated in the firſt method, ſuppoſing the rent 20 ſhillings, tithe and town charges rather high (as in Suffolk), taking up, and every thing included, will be about ſix pounds. In the laſt method, it would be ſomewhat reduced.

“When predilections for old cuſtoms are ſubdued (adds the author), I hope to ſee the potato admitted in the conſtant courſe of crops by every ſpirited huſbandman. The moſt beneficial effects will, I am certain, accrue from ſuch a ſyſtem. The advantages in my neighbourhood are apparent; I cultivated and fed my own children upon them, and my poorer neighbours ſenſibly followed the example. A great proportion of every cottager's garden is now occupied by this root, and it forms a principal part of their diet. Potatoes are cheap and excellent ſubſtitutes for peaſe in ſoups and broths, allowing double the quantity.

161
A cheap preparation for the poor.

“Although it is nearly a tranſcript of the directions given by a very ingenious author, yet I ſhall take the liberty of inſerting a receipt for making a potato-ſoup, which I have weekly diſtributed among the poor to their great relief.

	s.	d.
An ox's head - - - -	2	9
Two pecks of potatoes - -	0	6
Quarter of a peck of onions - -	0	3
Three quarters of a pound of ſalt -	0	1
An ounce and a half of pepper -	0	3
Total	3	10

Ninety pints of water to be boiled with the above ingredients on a ſlow fire until reduced to 60, which require one peck of coals, value three-pence. I have added the expence of every article according to their prices with me, that gentlemen may nearly perceive at how eaſy a rate they can feed 60 of their poor neighbours. I find from experience, a pint of this ſoup, with a ſmall piece of the meat, is ſufficient to ſatisfy a hearty working man with a good meal. If vegetables are plentiful, ſome of every ſort may be added, with a few ſweet herbs.

“I hope my inſerting the above, will not be eſteemed improper; though ſomewhat deviating from the culture of potatoes, it may poſſibly be a means of rendering them more extenſively uſeful.”

A premium having been offered by the abovementioned Society for the cultivation of potatoes by farmers, &c. whoſe rent does not exceed 40l. per annum, the following methods were communicated, by which thoſe who have only a ſmall ſpot of ground may obtain a plentiful crop.

162
Methods of cultivating potatoes on ſmall ſpots.

Firſt, then, the earth ſhould be dug 12 inches deep, if the ſoil will allow of it; after this, a hole ſhould be opened about ſix inches deep, horſe-dung, or long litter ſhould be put therein about three inches thick; this hole ſhould not be more than 12 inches in diameter; upon this dung or litter, a potato ſhould be planted whole, upon which a little more dung ſhould be ſhook, and then earth muſt be put thereon. In like manner the whole plot of ground muſt be planted, taking care that each potato be at leaſt 16 inches apart; and when the young ſhoots make their appearance, they ſhould have freſh mould drawn round them with a hoe; and if the tender ſhoots are covered, it will prevent the froſt from injuring them: they ſhould again be earthed when the ſhoots make a ſecond appearance, but not be covered, as in all probability the ſeaſon will then be leſs ſevere. A plentiful ſupply of mould ſhould be given them, and the perſon who performs this buſineſs ſhould never tread upon the plant, or the hillock that is raiſed round it; as the lighter the earth is, the more room the potato will have to expand. From a ſingle root thus planted, very near 40 pounds weight of large potatoes were obtained, and from almoſt every other root upon the ſame plot of ground from 15 to 20 pounds weight; and except the ſoil be ſtony or gravelly, 10 pounds or half a peck of potatoes may almoſt always be obtained from each root, by purſuing the

Practice.

the foregoing method. But note, cuttings or ſmall ſets will not do for this purpoſe.

163 Methods of culture adapted to ſmall farms

The ſecond method will ſuit the indolent, or thoſe who have not time to dig their ground, and that is, where weeds much abound and have not been cleared in the winter, a trench may be opened in a ſtraight line the whole length of the ground, and about ſix inches deep; in this trench the potatoes ſhould be planted about 10 inches apart; cuttings or ſmall potatoes will do for this method. When they are laid in the trench, the weeds that are on the ſurface may be pared off on each ſide about 10 inches from it, and be turned upon the plants; another trench ſhould then be dug, and the mould that comes out of it turned carefully on the weeds. It muſt not be forgot, that each trench ſhould be regularly dug, that the potatoes may be throughout the plot 10 or 12 inches from each other. This ſlovenly method will in general raiſe more potatoes than can be produced by digging the ground twice, and dibbling in the plants; and the reaſon is, that the weeds lighten the ſoil, and give the roots room to expand. They ſhould be twice hoed, and earthed up in rows. And here note, that if cut potatoes are to be planted, every cutting ſhould have two eyes, for though fewer ſets will be obtained, there will be a greater certainty of a crop, as one eye often fails or is deſtroyed by grubs in the earth.

When a crop of potatoes fail in part (as will ſometimes be the caſe in a dry ſeaſon), amends may ſtill be made by laying a little dung upon the knots of the ſtraw or haulm of thoſe potatoes that do appear, and covering them with mould; each knot or joint thus ordered will, if the weather prove wet afterwards, produce more potatoes than the original roots.

From the ſmalleſt potatoes planted whole, from four to ſix pounds at a root were obtained, and ſome of the ſingle potatoes weighed near two pounds. Theſe were dug in as before-mentioned, in trenches where the ground was covered with weeds, and the ſoil was a ſtiff loamy clay.

A good crop may be obtained by laying potatoes upon turf at about 12 or 14 inches apart, and upon beds of about ſix feet wide; on each ſide of which a trench ſhould be opened about three feet wide, and the turf that comes from thence ſhould be laid with the graſſy ſide downwards upon the potatoes; a ſpit of mould ſhould next be taken from the trenches, and be ſpread over the turf; and in like manner the whole plot of ground that is deſigned to be planted muſt be treated. And remark, that when the young ſhoots appear, another ſpit of mould from the trenches ſhould be ſtrewed over the beds ſo as to cover the ſhoots; this will prevent the froſt from injuring them, encourage them to expand, and totally deſtroy the young weeds; and when the potatoes are taken up in the autumn, a careful perſon may turn the earth again into the trenches, ſo as to make the ſurface level; and it will be right to remark, that from the ſame ground a much better crop of potatoes may be obtained the following year.

For field planting, a good (if not the beſt) method is to dung the land, which ſhould be once ploughed previous thereto; and when it is ploughed a ſecond time, a careful perſon ſhould drop the potato plants before the plough in every third furrow at about eight or ten inches apart. Plants that are cut with two eyes are beſt for this purpoſe. The reaſon for planting them at ſo great a diſtance as every third furrow, is, that when the ſhoots appear, a horſe-hoe may go upon the two vacant furrows to keep them clean; and after they are thus hoed, they ſhould be moulded up in ridges; and if this crop be taken up about October or November, the land will be in excellent condition to receive a crop of wheat. Lands that are full of twitch or couch-graſs may be made clean by this method, as the horſe-hoeing is as good as a ſummer-fallow; and if, when the potatoes are taken up, women and children were to pick out ſuch filth, not any traces of it would remain; and by laying it on heaps and burning it, a quantity of aſhes would be produced for manure.

After ploughing, none ſhould ever dibble in potatoes, as the perſons who dibble, plant, or hoe them, will all tread the ground; by which means it will become ſo bound, that the young fibres cannot expand, as has been already obſerved. Good crops have indeed been obtained by ploughing the land twice, and dropping the plants in every other furrow, and by hand-hoeing and earthing them up afterwards as the gardeners do peaſe; but this method is not equal to the other.

Vacant places in hedge-rows might be grubbed and planted with potatoes, and a good crop might be expected, as the leaves of trees, thorns, &c. are a good manure, and will ſurpriſingly encourage their growth, and gratify the wiſhes of the planter; who by cultivating ſuch places, will then make the moſt of his ground, and it will be in fine order to receive a crop of corn the following year.

164 Method of culture, &c. for which a premium was granted.

Account of the culture, expences, and produce of ſix acres of potatoes, being a fair part of near 70 acres, raiſed by John Billingſley, Eſq; and for which the premium was granted him in the year 1784.

EXPENCES.	£.	s.	d.
Plowing on oat-ſtubble in October 1783, at 4s. per acre - -	1	4	0
Croſs-ploughing in March 1784 -	1	4	0
Harrowing, 2s. per acre -	0	12	0
180 cart-loads of compoſt, 3l. per acre	18	0	0
42 ſacks of ſeed-potatoes (each ſack weighing 240 ℔.) of the white ſort -	10	10	0
Cutting the ſets, 6d. per ſack -	1	1	0
Setting on ridges eight feet wide (leaving an interval of two feet for an alley) 6d. for every 20 yards - -	10	12	0
Hoeing, at 5s. per acre - -	1	10	0
Digging up the two feet interval, and throwing the earth on the plants, at 10s. per acre - - -	3	0	0
Digging up the crop, at 8d. for every 20 yards in length, the breadth being 8 feet	14	6	0
Labour and expence of ſecuring in pits, wear and tear of baſkets, ſtraw, reed, ſpikes, &c. 10s. per acre -	3	0	0
Rent - - -	6	0	0
Tithe - - -	1	10	0
	72	9	0
Profit - - -	73	11	0
	L. 146	0	0

PRODUCE.	£.	s.	d.
600 ſacks of beſt potatoes at 4s.	120	0	0
120 ſacks middle-ſized, 3s. 6d.	21	0	0
50 of ſmall, 2s.	5	0	0
N. B. each ſack 240lb.			
	£. 146	0	0

The field on which the above experiment was made, was an oat-ſtubble in the autumn of 1783. In October it was ploughed, and left in a rough ſtate during the winter. In April it was croſs-ploughed and harrowed. On the 8th of May the field was marked out into beds or ridges eight feet wide, leaving a ſpace of two feet wide for an alley between every two ridges. The manure (a compoſt of ſtable dung, virgin earth, and ſcrapings of a turnpike road) was then brought on the land, and depoſited in ſmall heaps on the centre of each ridge, in the proportion of about 30 cart-loads to each acre. A trench was then opened with a ſpade, breadth-way of the ridge, about four inches deep; in this trench the potato-ſets were placed, at the diſtance of nine inches from each other; the dung was then ſpread in a trench on the ſets, and a ſpace or plit of 14 inches in breadth, dug in upon them. When the plants were about ſix inches high, they were carefully hoed, and ſoon after the two feet intervals between the ridges were dug, and the contents thrown around the young plants. This refreſhment, added to the ample manuring previouſly beſtowed, produced ſuch a luxuriance and rapidity of growth, that no weed could ſhow its head.

165 Beſt method of taking them up. The ſhorteſt and moſt certain method of taking up potatoes, is to plough once round every row at the diſtance of four inches, removing the earth from the plants, and gathering up with the hand all the potatoes that appear. The diſtance is made four inches, to prevent cutting the roots, which are ſeldom found above that diſtance from the row on each ſide. When the ground is thus cleared by the plough, raiſe the potatoes with a fork having three broad toes or claws; which is better than a ſpade, as it does not cut the potatoes. The potatoes thus laid above ground muſt be gathered with the hand. By this method ſcarce a potato will be left.

166 Of preſerving them. As potatoes are a comfortable food for the poor people, it is of importance to have them all the year round. For a long time, potatoes in Scotland were confined to the kitchen-garden; and after they were planted in the field, it was not imagined at firſt that they could be uſed after the month of December. Of late years, they have been found to anſwer even till April; which has proved a great ſupport to many a poor family, as they are eaſily cooked, and require neither kiln nor mill. But there is no cauſe for ſtopping there. It is eaſy to preſerve them till the next crop: when taken out of the ground, lay in the corner of a barn a quantity that may ſerve till April, covered from froſt with dry ſtraw preſſed down: bury the remainder in a hole dug in dry ground, mixed with the huſks of dried oats, ſand, or the dry leaves of trees, over which build a ſtack of hay or corn. When the pit is opened for taking out the potatoes, the eyes of what have a tendency to puſh muſt be cut out; and this cargo will ſerve all the month of June. To be ſtill more certain of making the old crop meet the new, the ſetting of a ſmall quantity may be delayed till June, to be taken up at the ordinary time before froſt. This cargo, having not arrived to full growth, will not be ſo ready to puſh as what are ſet in April.

If the old crop happen to be exhauſted before the new crop is ready, the interval may be ſupplied by the potatoes of the new crop that lie next the ſurface, to be picked up with the hand; which, far from hurting the crop, will rather improve it.

3. CARROT and PARSNIP.

167 Culture of carrot. OF all roots, a carrot requires the deepeſt ſoil. It ought at leaſt to be a foot deep, all equally good from top to bottom. If ſuch a ſoil be not in the farm, it may be made artificially by trench-ploughing, which brings to the ſurface what never had any communication with the ſun or air. When this new ſoil is ſufficiently improved by a crop or two with dung, it is fit for bearing carrots. Beware of dunging the year when the carrots are ſown; for with freſh dung they ſeldom eſcape rotten ſcabs.

The only ſoils proper for that root, are a loam and a ſandy ſoil.

The ground muſt be prepared by the deepeſt furrow that can be taken, the ſooner after harveſt the better; immediately upon the back of which, a ribbing ought to ſucceed, as directed for barley. At the end of March, or beginning of April, which is the time for ſowing the ſeed, the ground muſt be ſmoothed with a brake. Sow the ſeed in drills, with intervals of a foot for hand-hoeing: which is no expenſive operation where the crop is confined to an acre or two: but if the quantity of ground be greater, the intervals ought to be three feet, in order for horſe-hoeing.

In flat ground without ridges, it may be proper to make parallel furrows with the plough, ten feet from each other, in order to carry off any redundant moiſture.

At Parlington in Yorkſhire, from the end of September to the firſt of May, 20 work-horſes, four bullocks, and ſix milk-cows, were fed on the carrots that grew on three acres; and theſe animals never taſted any other food but a little hay. The milk was excellent: and, over and above, 30 hogs were fattened upon what was left by the other beaſts. We have this fact from undoubted authority.

The culture of parſnips is the ſame with that of carrots. 168 Parſnips.

III. Plants cultivated for Leaves, or for both Leaves and *Root*.

THERE are many garden-plants of theſe kinds. The plants proper for the field are cabbage red and white, colewort plain and curled, turnip-rooted cabbage, and the root of ſcarcity.

169 Culture of cabbage. 1. Cabbage is an intereſting article in huſbandry. It is eaſily raiſed, is ſubject to few diſeaſes, reſiſts froſt more than turnip, is palatable to cattle, and ſooner fills them than turnips, carrots, or potatoes.

The ſeaſon for ſetting cabbage depends on the uſe it is intended for. If intended for feeding in November, December, and January, plants procured from ſeed ſown the end of July the preceding year muſt be ſet in March or April. If intended for feeding in March, April, and May, the plants muſt be ſet the firſt week of the preceding July, from ſeed ſown in the end of February or beginning of March the ſame year. The late ſetting of the plants retards their growth; by which means they have a vigorous growth the following ſpring. And this crop makes an important link in the chain that connects winter and ſummer green food. Where cabbage for ſpring-food happens to be neglected, a few acres of rye, ſown at Michaelmas, will ſupply the want. After the rye is conſumed, there is time ſufficient to prepare the ground for turnip.

And now to prepare a field for cabbage. Where the plants are to be ſet in March, the field muſt be made up after harveſt, in ridges three feet wide. In that form let it lie all winter, to be mellowed with air and froſt. In March, take the firſt opportunity, between wet and dry, to lay dung in the furrows. Cover the dung with a plough, which will convert the furrow into a crown, and conſequently the crown into a furrow. Set the plants upon the dung, diſtant from each other three feet. Plant them ſo as to make a ſtraight line acroſs the ridges, as well as along the furrows, to which a gardener's line ſtretched perpendicularly acroſs the furrows will be requiſite. This will ſet each plant at the diſtance preciſely of three feet from the plants that ſurround it. The purpoſe of this accuracy is to give opportunity for ploughing, not only along the ridges, but croſs them. This mode is attended with three ſignal advantages: it ſaves hand-hoeing, it is a more complete dreſſing to the ſoil, and it lays earth neatly round every plant.

If the ſoil be deep and compoſed of good earth, a trench-ploughing after the preceding crop will not be amiſs; in which caſe, the time for dividing the field into three feet ridges, as above, ought to be immediately before the dunging for the plants.

If weeds happen to riſe ſo cloſe to the plants as not to be reached by the plough, it will require very little labour to deſtroy them with a hand-hoe.

Unleſs the ſoil be much infeſted with annuals, twice ploughing after the plants are ſet will be a ſufficient dreſſing. The firſt removes the earth from the plants; the next, at the diſtance of a month or ſo, lays it back.

Where the plants are to be ſet in July, the field muſt be ribbed as directed for barley. It ought to have a ſlight ploughing in June before the planting, in order to looſen the ſoil, but not ſo as to bury the ſurface-earth; after which the three-feet ridges muſt be formed, and the other particulars carried on as directed above with reſpect to plants that are to be ſet in March.

170
Cultivation of the turnip-rooted cabbages.

2. As to the *turnip-rooted cabbages*, their importance and value ſeem only to have been lately aſcertained. In the Bath Society Papers we have the following account of Sir Thomas Beevor's method of cultivating them; which from experience he found to be cheaper and better than any other.

“ In the firſt or ſecond week of June, I ſow the ſame quantity of ſeed, hoe the plants at the ſame ſize, leave them at the ſame diſtance from each other, and treat them in all reſpects like the common turnip. In this method I have always obtained a plentiful crop of them; to aſcertain the value of which I need only inform you, that on the 23d day of April laſt, having then two acres left of my crop, ſound, and in great perfection, I divided them by fold hurdles into three parts of nearly equal dimenſions. Into the firſt part I put 24 ſmall bullocks of about 30 ſtone weight each (14 lb to the ſtone), and 30 middle-ſized fat wethers, which, at the end of the firſt week, after they had eaten down the greater part of the leaves, and ſome part of the roots, I ſhifted into the ſecond diviſion, and then put 70 lean ſheep into what was left of the firſt; theſe fed off the remainder of the turnips left by the fat ſtock; and ſo they were ſhifted through the three diviſions, the lean ſtock following the fat as they wanted food, until the whole was conſumed.

171
Their utility and value.

The 24 bullocks and 30 fat wethers continued in the turnips until the 21ſt of May, being exactly four weeks; and the 70 lean ſheep until the 29th, which is one day over four weeks: ſo that the two acres kept my 24 ſmall bullocks and 110 ſheep four weeks (not reckoning the overplus day of keeping the lean ſheep); the value, at the rate of keeping at that ſeaſon, cannot be eſtimated in any common year at leſs than 4d. a-week for each ſheep, and 1s. 6d. per week for each bullock, which would amount together to the ſum of L. 14 : 10 : 8 for the two acres.

“ You will hardly, I conceive, think I have ſet the price of keeping the ſtock at too high a rate; it is beneath the price here in almoſt every ſpring, and in this laſt it would have coſt double, could it have been procured; which was ſo far from being the caſe, that hundreds of ſheep and lambs here were loſt, and the reſt greatly pinched for want of food.

“ You will obſerve, gentlemen, that in the valuation of the crop abovementioned I have claimed no allowance for the great benefit the farmer receives by being enabled to ſuffer his graſs to get into a forward growth, nor for the ſuperior quality of theſe turnips in fattening his ſtock; both which circumſtances muſt ſtamp a new and a great additional value upon them. But as their continuance on the land may ſeem to be injurious to the ſucceeding crop, and indeed will deprive the farmer totally of either oats or barley; ſo to ſupply that loſs I have always ſown buck-wheat on the firſt earth upon the land from which the turnips were thus fed off; allowing one buſhel of ſeed per acre, for which I commonly receive from five to ſix quarters per acre in return. And that I may not throw that part of my land out of the ſame courſe of tillage with the reſt, I ſow my clover or other graſs-ſeeds with the buck-wheat, in the ſame manner as with the oat or barley crops, and have always found as good a *layer* (lea) of it afterwards.

“ Thus you ſee, that in providing a moſt incomparable vegetable for food for cattle, in that ſeaſon of the year in which the farmer is generally moſt diſtreſſed, and his cattle almoſt ſtarved, a conſiderable profit may likewiſe be obtained, much beyond what is uſually derived from his former practice, by the great produce and price of a crop raiſed at ſo eaſy an expence as that of buck-wheat, which, with us, ſells commonly at the ſame price as barley, oftentimes more, and but very rarely for leſs.

“ The land on which I have uſually ſown turnip-rooted cabbages is a dry mixed ſoil, worth 15s. per acre.”

To the preceding account the Society have ſubjoined the following note: “ Whether we regard the importance of the ſubject, or the clear and practical information which the foregoing letter conveys, it may be conſidered as truly intereſting as any we have ever been favoured with; and therefore it is recommended in the ſtrongeſt manner to farmers in general, that they adopt a mode of practice ſo deciſively aſcertained to be in a high degree judicious and profitable."

172 Recommendation by the Bath Society.

To raiſe the turnip-rooted cabbage for tranſplanting, the beſt method yet diſcovered is, to breaſt-plough and burn as much old paſture as may be judged neceſſary for the ſeed-bed; two perches well ſtocked with plants will be ſufficient to plant an acre. The land ſhould be dug as ſhallow as poſſible, turning the aſhes in; and the ſeed ſhould be ſown the beginning of April.

173 To raiſe the turnip-rooted cabbage for tranſplanting.

The land intended for the plantation to be cultivated and dunged as for the common turnip. About Midſummer (or ſooner if the weather will permit) will be a proper time for planting, which is beſt done in the following manner: the land to be thrown into *one-bout* ridges, upon the tops of which the plants are to be ſet, at about 18 inches diſtance from each other. As ſoon as the weeds riſe, give a hand-hoeing, afterwards run the ploughs in the intervals, and fetch a furrow from each ridge, which, after laying a fortnight or three weeks, is again thrown back to the ridges; if the weeds riſe again, it is neceſſary to give them another hand-hoeing.

If the young plants in the ſeed-bed ſhould be attacked by the fly, ſow wood-aſhes over them when the dew is on, which will effectually prevent the ravages they would otherwiſe make.

174 Culture of the root of ſcarcity.

3. The *racine de diſette*, or root of ſcarcity, (*Beta cicla*) delights in a rich loamy land well dunged. It is directed to be ſown in rows, or broad-caſt, and as ſoon as the plants are of the ſize of a gooſequill, to be tranſplanted in rows of 18 inches diſtance, and 18 inches apart, one plant from the other: care muſt be taken in the ſowing, to ſow very thin, and to cover the ſeed, which lays in the ground about a month, an inch only.—In tranſplanting, the root is not to be ſhortened, but the leaves cut at the top: the plant is then to be planted with a ſetting-ſtick, ſo that the upper part of the root ſhall appear about half an inch out of the ground; this laſt precaution is very neceſſary to be attended to. Theſe plants will ſtrike root in twenty-four hours, and a man a little accuſtomed to planting, will plant with eaſe 1800 or 2000 a-day. In the ſeed-bed, the plants, like all others, muſt be kept clear of weeds: when they are planted out, after once hoeing, they will take care of themſelves, and ſuffocate every kind of weed near them.

The beſt time to ſow the ſeed is from the beginning of March to the middle of April: it is, however, adviſed to continue ſowing every month until the beginning of July, in order to have a ſucceſſion of plants. Both leaves and roots have been extolled as excellent both for man and beaſt. This plant is ſaid not to be liable, like the turnip, to be deſtroyed by inſects, for no inſect touches it, nor is it affected by exceſſive drought, or the changes of ſeaſons. Horned cattle, horſe, pigs, and poultry, are exceedingly fond of it when cut ſmall. The leaves may be gathered every 12 or 15 days; they are from 30 to 40 inches long, by 22 to 25 inches broad. This plant is excellent for milch cows, when given to them in proper proportions, as it adds much to the quality as well as quantity of their milk; but care muſt be taken to proportion the leaves with other green food, otherwiſe it would abate the milk, and fatten them too much, it being of ſo exceeding fattening a quality. To put all theſe properties beyond doubt, however, further experiments are wanting.

Sect. IV. *Culture of Graſs.*

175 Of laying down fields to graſs.

The latter end of Auguſt, or the beginning of September, is the beſt ſeaſon for growing graſs-ſeeds, as there is time for the roots of the young plants to fix themſelves before the ſharp froſts ſet in. It is ſcarce neceſſary to ſay, that moiſt weather is beſt for ſowing; the earth being then warm, the ſeeds will vegetate immediately; but if this ſeaſon prove unfavourable, they will do very well the middle of March following.

If you would have fine paſture, never ſow on foul land. On the contrary, plough it well, and clear it from the roots of couch-graſs, reſt-harrow, fern, broom, and all other noxious weeds. If theſe are ſuffered to remain, they will ſoon get above, and deſtroy your young graſs. Rake theſe up in heaps, and burn them on the land, and ſpread the aſhes as a manure. Theſe ploughings and harrowings ſhould be repeated in dry weather. And if the ſoil be clayey and wet, make ſome under-drains to carry off the water, which, if ſuffered to remain, will not only chill the graſs, but make it ſour. Before ſowing, lay the land as level and fine as poſſible. If your graſs-ſeeds are clean, (which ſhould always be the caſe) three buſhels will be ſufficient per acre. When ſown, harrow it in gently, and roll it in with a wooden roller. When it comes up, fill up all the bare ſpots by freſh ſeed, which, if rolled to fix it, will ſoon come up, and overtake the reſt.

In Norfolk they ſow clover with their graſſes, particularly with rye-graſs; but this ſhould not be done except when the land is deſigned for graſs only three or four years, becauſe neither of theſe kinds will laſt long in the land. Where you intend it for a continuance, it is better to mix only ſmall white Dutch clover, or marle graſs, with your other graſs ſeed, and not more than eight pounds to an acre. Theſe are abiding plants, ſpread cloſe on the ſurface, and make the ſweeteſt feed of any for cattle. In the following ſpring, root up thiſtles, hemlock, or any large plants that appear. The doing this while the ground is ſoft enough to permit your drawing them by the roots, and before they feed, will ſave you infinite trouble afterwards.

The common method of proceeding in laying down fields to graſs is extremely injudicious. Some ſow barley with their graſſes, which they ſuppoſe to be uſeful in ſhading them, without conſidering how much the corn draws away the nouriſhment from the land.

176 Different kinds of grain.

Others take their ſeeds from a foul hay-rick; by which means, beſides filling the land with rubbiſh and weeds, what they intend for dry ſoils may have come from moiſt, where it grew naturally, and *vice verſa*. The conſequence is, that the ground, inſtead of being covered with a good thick ſward, is filled with plants unnatural to it. The kinds of graſs moſt eligible for paſture-lands are, the annual-meadow, creeping, and fine bent, the fox-tails, and creſted dog's-tail, the poas, the feſcues, the vernal, oat-graſs, and the ray, or rye-graſs. We do not, however, approve of ſowing all theſe kinds together; for not to mention their ripening at different times, by which means you can never cut them all in perfection and full vigour, no kind of cattle are fond of all alike.

Horſes will ſcarcely eat hay which oxen and cows will thrive upon; ſheep are particularly fond of ſome kinds and refuſe others. The Darnel graſs, if not cut before ſeveral of the other kinds are ripe, becomes ſo hard and wiry in the ſtalks, that few cattle care to eat it.

Such gentlemen as wiſh a particular account of the above-mentioned graſſes, will be amply gratified in conſulting Mr Stillingfleet on this ſubject. He has treated it with great judgment and accuracy, and thoſe who follow his directions in the choice of their graſſes will be under no ſmall obligation to him for the valuable information he has given them. The ſubſtance of his obſervations are given in the article GRASSES in this Dictionary.

The graſſes commonly ſown for paſture, for hay, or to cut green for cattle, are red clover, white clover, yellow clover, rye-graſs, narrow-leaved plantain commonly called *ribwort*, ſain-foin, and lucerne.

Red clover is of all the moſt proper to be cut green for ſummer-food. It is a biennial plant when ſuffered to perfect its ſeed; but when cut green, it will laſt three years, and in a dry ſoil longer. At the ſame time the ſafeſt courſe is to let it ſtand but a ſingle year: if the ſecond year's crop happen to be ſcanty, it proves, like a bad crop of peaſe, a great encourager of weeds by the ſhelter it affords them.

Here, as in all other crops, the goodneſs of ſeed is of importance. Chooſe plump ſeed of a purple colour, becauſe it takes on that colour when ripe. It is red when hurt in the drying, and of a faint colour when unripe.

177
Of red clover.

Red clover is luxuriant upon a rich ſoil, whether clay, loam, or gravel: it will grow even upon a moor, when properly cultivated. A wet ſoil is its only bane; for there it does not thrive.

To have red clover in perfection, weeds muſt be extirpated, and ſtones taken off. The mould ought to be made as fine as harrowing can make it; and the ſurface be ſmoothed with a light roller, if not ſufficiently ſmooth without it. This gives opportunity for diſtributing the ſeed evenly; which muſt be covered by a ſmall harrow with teeth no larger than that of a garden-rake, three inches long, and ſix inches aſunder*. In harrowing, the man ſhould walk behind with a rope in his hand fixed to the back part of the harrow, ready to diſentangle it from ſtones, clods, turnip or cabbage-roots, which would trail the ſeed, and diſplace it.

Nature has not determined any preciſe depth for the ſeed of red clover more than for other ſeed. It will grow vigorouſly from two inches deep, and it will grow when barely covered. Half an inch may be reckoned the moſt advantageous poſition in clay ſoil, a whole inch in what is light or looſe. It is a vulgar error, that ſmall ſeed ought to be ſparingly covered. Miſled by that error, farmers commonly cover their clover-ſeed with a buſhy branch of thorn; which not only covers it unequally, but leaves part on the ſurface to wither in the air.

The proper ſeaſon for ſowing red-clover, is from the middle of April to the middle of May. It will ſpring from the firſt of March to the end of Auguſt; but ſuch liberty ought not to be taken except from neceſſity.

There cannot be a greater blunder in huſbandry, than to be ſparing of ſeed. Ideal writers talk of ſowing an acre with four pounds. That quantity of ſeed, ſay they, will fill an acre with plants as thick as they ought to ſtand. This rule may be admitted where grain is the object; but it will not anſwer with reſpect to graſs. Graſs-ſeed cannot be ſown too thick: the plants ſhelter one another: they retain all the dew: and they muſt puſh upwards having no room laterally. Obſerve the place where a ſack of peaſe, or of other grain, has been ſet down for ſowing: the ſeed dropt there accidentally grows more quickly than in the reſt of the field ſown thin out of hand. A young plant of clover, or of ſain-foin, according to Tull, may be raiſed to a great ſize where it has room; but the field will not produce half the quantity. When red clover is ſown for cutting green, there ought not to be leſs than 24 pounds to an acre. A field of clover is ſeldom too thick: the ſmaller a ſtem be, the more acceptable it is to cattle. It is often too thin; and when ſo, the ſtems tend to wood.

178
Of ſowing clover with grain.

Red clover is commonly ſown with grain; and the moſt proper grain has been found by experience to be flax. The ſoil muſt be highly cultivated for flax as well as for red clover. The proper ſeaſon of ſowing is the ſame for both; the leaves of flax being very ſmall, admit of free circulation of air; and flax being an early crop, is removed ſo early as to give the clover time for growing. In a rich ſoil it has grown ſo faſt, as to afford a good cutting that very year. Next to flax, barley is the beſt companion to clover. The ſoil muſt be looſe and free for barley; and ſo it ought to be for clover; the ſeaſon of ſowing is the ſame; and the clover is well eſtabliſhed in the ground, before it is over-topped by the barley. At the ſame time, barley commonly is ſooner cut than either oats or wheat. In a word, barley is rather a nurſe than a ſtepmother to clover during its infancy. When clover is ſown in ſpring upon wheat, the ſoil, which has lain five or ſix months without being ſtirred, is an improper bed for it; and the wheat, being in the vigour of growth, overtops it from the beginning. It cannot be ſown along with oats, becauſe of the hazard of froſt; and when ſown as uſual among the oats three inches high, it is over-topped, and never enjoys free air till the oats be cut. Add, that where oats are ſown upon the winter-furrow, the ſoil is rendered as hard as when under wheat.—Red clover is ſometimes ſown by itſelf without other grain; but this method, beſide loſing a crop, is not ſalutary; becauſe clover in its infant ſtate requires ſhelter.

As to the quantity of grain proper to be ſown with clover: In a rich ſoil well pulverized, a peck of barley on an Engliſh acre is all that ought to be ventured; Two Linlithgow firlots make the proper quantity for an acre that produces commonly ſix bolls of barley; half a firlot for what produces nine bolls. To thoſe who are governed by cuſtom, ſo ſmall a quantity will be thought ridiculous. Let them only conſider, that a rich ſoil in perfect good ooder, will from a ſingle ſeed of barley produce 20 or 30 vigorous ſtems. People may flatter themſelves with the remedy of cutting barley green for food, if it happen to oppreſs the clover. This is an excellent remedy in a field of an acre or two; but the cutting an extenſive field for food muſt be ſlow; and while one part is cutting, the clover is ſmothered in other parts.

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* Plate VI. fig. 7.

179
White and yellow clover, ribwort, and rye-graſs.

The culture of white clover, of yellow clover, of ribwort, of rye-graſs, is the ſame in general with that of red-clover. We proceed to their peculiarities. Yellow clover, ribwort, rye-graſs, are all of them early plants, blooming in the end of April or beginning of May. The two latter are evergreens, and therefore excellent for winter-paſture. Rye-graſs is leſs hurt by froſt than any of the clovers, and will thrive in a moiſter ſoil: nor in that ſoil is it much affected by drought. In a rich ſoil, it grows four feet high: even in the dry ſummer of 1775, it roſe to three feet eight inches; but it had gained that height before the drought came on. Theſe graſſes are generally ſown with red-clover for producing a plentiful crop. The proportion of ſeed is arbitrary; and there is little danger of too much. When rye graſs is ſown for procuring ſeed, five firlots wheat-meaſure may be ſown on an acre; and for procuring ſeed of ribwort, 40 pounds may be ſown. The roots of rye-graſs ſpread horizontally: they bind the ſoil by their number; and tho' ſmall, are yet ſo vigorous as to thrive in hard ſoil. Red clover has a large tap-root, which cannot penetrate any ſoil but what is open and free; and the largeneſs of the root makes the ſoil ſtill more open and free. Rye-graſs, once a great favourite, appears to be diſcarded in moſt parts of Britain. The common practice has been, to ſow it with red clover, and to cut them promiſcuouſly the beginning of June for green food, and a little later for hay. This indeed is the proper ſeaſon for cutting red clover, becauſe at that time it begins to flower; but as at that time the ſeed of the rye-graſs is approaching to maturity, its growth is ſtopped for that year, as much as of oats or barley cut after the ſeed is ripe. Oats or barley cut green before the ſeed forms, will afford two other cuttings; which is the caſe of rye-graſs, of yellow clover, and of ribwort. By ſuch management, all the profit will be drawn that theſe plants can afford.

When red clover is intended for ſeed, the ground ought to be cleared of weeds, were it for no other purpoſe than that the ſeed cannot otherwiſe be preſerved pure: what ſeeds eſcape the plough ought to be taken out by the hand. In England, when a crop of ſeed is intended, the clover is always firſt cut for hay. This appears to be done, as in fruit-trees, to check the growth of the wood, in order to encourage the fruit. This practice will not anſwer in Scotland, as the ſeed would often be too late for ripening. It would do better to eat the clover with ſheep till the middle of May, which would allow the ſeed to ripen. The ſeed is ripe when, upon rubbing it between the hands, it parts readily from the huſk. Then apply the ſcythe, ſpread the crop thin, and turn it carefully. When perfectly dry, take the firſt opportunity of a hot day for threſhing it on the boards covered with a coarſe ſheet. Another way leſs ſubject to riſk, is to ſtack the dry hay, and to threſh it in the end of April. After the firſt threſhing, expoſe the huſks to the ſun, and threſh them over and over till no ſeed remain. Nothing is more efficacious than a hot ſun to make the huſk part with its ſeed; in which view it may be expoſed to the ſun by parcels, an hour or two before the flail is applied.

White clover, intended for ſeed, is managed in the ſame manner. No plant ought to be mixed with rye-graſs that is intended for ſeed. In Scotland, much rye-graſs ſeed is hurt by tranſgreſſing that rule. The ſeed is ripe when it parts eaſily with the huſk. The yellowneſs of the ſtem is another indication of its ripeneſs; in which particular it reſembles oats, barley, and other culmiferous plants. The beſt manner to manage a crop of rye-graſs for ſeed, is to bind it looſely in ſmall ſheaves, widening them at the bottom to make them ſtand erect; as is done with oats in moiſt weather. In that ſtate they may ſtand till ſufficiently dry for threſhing. By this method they dry more quickly, and are leſs hurt by rain, than by cloſe binding and putting the ſheaves in ſhocks like corn. The worſt way of all is to ſpread the rye-graſs on the moiſt ground, for it makes the ſeed malten. The ſheaves, when ſufficiently dry, are carried in cloſe carts to where they are to be threſhed on a board, as mentioned above for clover. Put the ſtraw in a rick when a hundred ſtone or ſo are threſhed. Carry the threſhing-board to the place where another rick is intended; and ſo on till the whole ſeed be threſhed, and the ſtraw ricked. There is neceſſity for cloſe carts to ſave the ſeed, which is apt to drop out in a hot ſun; and, as obſerved above, a hot ſun ought always to be choſen for threſhing. Carry the ſeed in ſacks to the granary or barn, there to be ſeparated from the huſks by a fanner. Spread the ſeed thin upon a timber-floor, and turn it once or twice a-day till perfectly dry. If ſuffered to take a heat, it is uſeleſs for ſeed.

180
Culture of ſain-foin.

The writers on agriculture reckon ſain-foin preferable to clover in many reſpects: They ſay, that it produces a larger crop; that it does not hurt cattle when eaten green; that it makes better hay; that it continues four times longer in the ground: and that it will grow on land that will bear no other crop.

Sain-foin has a very long tap-root, which is able to pierce very hard earth. The roots grow very large; and the larger they are, they penetrate to the greater depth: and hence it may be concluded, that this graſs, when it thrives well, receives a great part of its nouriſhment from below the *ſtaple* of the ſoil: of courſe, a deep dry ſoil is beſt for the culture of ſain-foin. When plants draw their nouriſhment from that part of the ſoil that is near the ſurface, it is not of much conſequence whether their number be great or ſmall. But the caſe is very different when the plants receive their food, not only near, but alſo deep below, the ſurface. Beſides, plants that ſhoot their roots deep are often ſupplied with moiſture, when thoſe near the ſurface are parched with drought.

To render the plants of ſain-foin vigorous, it is neceſſary that they be ſown thin. The beſt method of doing this is by a drill; becauſe, when ſown in this manner, not only the weeds, but alſo the ſupernumerary plants, can eaſily be removed. It is ſeveral years before ſain-foin comes to its fulleſt ſtrength; and the number of plants ſufficient to ſtock a field, while in this imperfect ſtate, will make but a poor crop for the firſt year or two. It is therefore neceſſary that it be ſown in ſuch a manner as to make it eaſy to take up plants in ſuch numbers, and in ſuch order, as always to leave in the field the proper number in their proper places. This can only be done, with propriety, by ſowing the plants in rows by a drill. Suppoſing a field to be drilled in rows at ten inches diſtance, the partitions may be hand-hoed, and the rows dreſſed in ſuch a manner as to leave a proper number of plants. In this ſituation the field may remain two years; then one-fourth of the rows may be taken out in pairs, in ſuch a manner as to make the beds of fifty inches, with ſix rows in each, and intervals of thirty inches, which may be ploughed. Next year, another fourth of the rows may be taken out in the ſame manner, ſo as to leave double rows with partitions of ten inches, and intervals of thirty: All of which may be hoed at once or alternately, as it may be found moſt convenient.

The great quantity of this graſs which the writers on this ſubject aſſure us may be raiſed upon an acre, and the excellency and great value of the hay made of it, ſhould induce farmers to make a complete trial of it, and even to uſe the ſpade in place of the hoe, or hoe-plough if neceſſary.

The plants taken up from a field of ſain-foin may be ſet in another field; and if the tranſplanting of this graſs ſucceeds as well as the tranſplanting of lucerne has done with Mr Lunin de Chatevieux, the trouble and expence will be ſufficiently recompenſed by the largeneſs of the crops. In tranſplanting, it is neceſſary to cut off great part of the long tap-root: this will prevent it from ſtriking very deep into the ſoil, and make it puſh out large roots in a ſloping direction from the cut end of the tap-root. Sain-foin managed in this manner, will thrive even on ſhallow land that has a wet bottom, provided it be not overſtocked with plants.

Whoever inclines to try the culture of this graſs ſhould take great pains in preparing the land, and making it as free from weeds as poſſible.

In England, as the roots ſtrike deep in that chalky ſoil, this plant is not liable to be ſo much injured by drought as other graſſes are, whoſe fibres lie horizontally, and lie near the ſurface. The quantity of hay produced is greater and better in quality than any other. But there is one advantage attending this graſs, which renders it ſuperior to any other; and that ariſes from feeding with it milch cows. The prodigious increaſe of milk which it makes is aſtoniſhing, being nearly double that produced by any other green food. The milk is alſo better, and yields more cream than any other; and the butter procured from it much better coloured and flavoured.

The following remarks by an Engliſh farmer are made from much experience and obſervation.

181 Remarks on the culture of ſain-foin in England.

Sain-foin is much cultivated in thoſe parts where the ſoil is of a chalky kind. It will always ſucceed well where the roots run deep; the worſt ſoil of all for it is where there is a bed of cold wet clay, which the tender fibres cannot penetrate. This plant will make a greater increaſe of produce, by at leaſt 30 times, than common graſs or turf upon poor land. Where it meets with chalk or ſtone, it will extend its roots through the cracks and chinks to a very great depth in ſearch of nouriſhment. The dryneſs is of more conſequence than the richneſs of land for ſain-foin; although land that is both dry and rich will always produce the largeſt crops.

It is very commonly ſown broad-caſt; but it is found to anſwer beſt in drills, eſpecially if the land be made fine by repeated ploughing, rolling, and harrowing. Much depends on the depth which this ſeed is ſown. If it be buried more than an inch deep, it will ſeldom grow; and if left uncovered, it will puſh out its roots above ground, and theſe will be killed by the air. March and the beginning of April are the beſt ſeaſons for ſowing it, as the ſeverity of winter and the drought of ſummer are equally unfavourable to the young plants. A buſhel of ſeed ſown broad-caſt, or half that quantity in drills, if good, is ſufficient for an acre. The drills ſhould be 30 inches apart, to admit of horſe-hoeing between them. Much, however, depends on the goodneſs of the ſeed, which may be beſt judged of by the following marks.

The huſk being of a bright colour, the kernel plump, of a grey or bluiſh colour without, and, if cut acroſs, greeniſh and freſh withinſide; if it be thin and furrowed, and of a yellowiſh caſt, it will ſeldom grow. When the plants ſtand ſingle, and have room to ſpread, they produce the greateſt quantity of herbage, and the ſeed ripens beſt. But farmers in general, from a miſtaken notion of all that appears to be waſte ground being unprofitable, plant them ſo cloſe, that they choke and impoveriſh each other, and often die in a few years. Single plants run deepeſt and draw moſt nouriſhment; they are alſo eaſieſt kept free from weeds. A ſingle plant will often produce half a pound of hay, when dry. On rich land this plant will yield two good crops in a year, with a moderate ſhare of culture. A good crop muſt not be expected the firſt year; but, if the plants ſtand not too thick, they will increaſe in ſize the ſecond year prodigiouſly.

No cattle ſhould be turned on the field the firſt winter after the corn is off with which it is ſown, as their feet would injure the young plants. Sheep ſhould not come on the following ſummer, becauſe they would bite off the crown of the plants, and prevent their ſhooting again. A ſmall quantity of ſoapers aſhes as a top-dreſſing will be of great ſervice, if laid on the firſt winter.

If the ſain-foin be cut juſt before it comes into bloom, it is admirable food for horned cattle; and if cut thus early, it will yield a ſecond crop the ſame ſeaſon. But if it proves a wet ſeaſon, it is better to let it ſtand till its bloom be perfected; for great care muſt be taken, in making it into hay, that the flowers do not drop off, as cows are very fond of them; and it requires more time than other hay in drying. Sain-foin is ſo excellent a fodder for horſes, that they require no oats while they eat it, although they be worked hard all the time. Sheep will alſo be fattened with it faſter than with any other food.

If the whole ſeaſon for cutting proves very rainy, it is better to let the crop ſtand for ſeed, as that will amply repay the loſs of the hay; becauſe it will not only fetch a good price, but a peck of it will go as far as a peck and a half of oats for horſes.

The beſt time for cutting the ſeeded ſain-foin is, when the greateſt part of the ſeed is well filled, the firſt blown ripe, and the laſt blown beginning to open. For want of this care ſome people have loſt moſt of their ſeed by letting it ſtand to ripe. Seeded ſain-foin ſhould always be cut in a morning or evening, when the dews render the ſtalks tender. If cut when the ſun ſhines hot, much of the ſeed will fall out and be loſt.

182 Its excellence as food for cows.

An acre of very ordinary land, when improved by this graſs, will maintain four cows very well from the firſt of April to the end of November; and afford, beſides, a ſufficient ſtore of hay to make the greater part of their food the four months following.

If the ſoil be tolerably good, a field of ſain-foin will laſt from 15 to 20 years in prime; but at the end of ſeven or eight years, it will be neceſſary to lay on a moderate coat of well-rotted dung; or, if the ſoil be very light and ſandy, of marle. By this means the future crops, and the duration of the plants in health and vigour, will be greatly increaſed and prolonged. Hence it will appear, that for poor land there is nothing equal to this graſs in point of advantage to the farmer.

Clover will laſt only two years in perfection; and often, if the ſoil be cold and moiſt, near half the plants will rot, and bald patches be found in every part of the field the ſecond year. Beſides, from our frequent rains during the month of September, many crops left for feeding are loſt. But from the quantity and excellent quality of this graſs (ſain-foin), and its ripening earlier, and continuing in vigour ſo much longer, much riſk and certain expence is avoided, and a large annual profit accrues to the farmer.

183 Culture of lucerne.

The writers on agriculture, ancient as well as modern, beſtow the higheſt encomiums upon lucerne as affording excellent hay, and producing very large crops. Lucerne remains at leaſt 10 or 12 years in the ground, and produces about eight tons of hay upon the Scots acre. There is but little of it cultivated in Scotland. However, it has been tried in ſeveral parts of that country; and it is found, that, when the ſeed is good, it comes up very well, and ſtands the winter froſt. But the chief thing that prevents this graſs from being more uſed in Scotland, is the difficulty of keeping the ſoil open and free from weeds. In a few years the ſurface becomes ſo hard, and the turf ſo ſtrong, that it deſtroys the lucerne before the plants have arrived at their greateſt perfection: ſo that lucerne can ſcarce be cultivated with ſucceſs there, unleſs ſome method be fallen upon of deſtroying the natural graſs, and prevent the ſurface from becoming hard and impenetrable. This cannot be done effectually by any other means than horſe-hoeing. This method was firſt propoſed by Mr Tull, and afterwards practiſed ſucceſsfully by M. de Chateauvieux near Geneva. It may be of uſe therefore to give a view of that gentleman's method of cultivating lucerne.

He does not mention any thing particular as to the manner of preparing the land; but only obſerves in general, that no pains ſhould be ſpared in preparing it. He tried the ſowing of lucerne both in rows upon the beds where it was intended to ſtand, and likewiſe the ſowing it in a nurſery, and afterwards tranſplanting it into the beds prepared for it. He prefers tranſplanting; becauſe, when tranſplanted, part of the tap-root is cut off, and the plant ſhoots out a number of lateral branches from the cut part of the root, which makes it ſpread its roots nearer the ſurface, and conſequently renders it more eaſily cultivated: beſides, this circumſtance adapts it to a ſhallow ſoil, in which, if left in its natural ſtate, it would not grow.

The tranſplanting of lucerne is attended with many advantages. The land may be prepared in the ſummer for receiving the plants from the nurſery in autumn; by which means the field muſt be in a much better ſituation than if the ſeed had been ſown upon it in the ſpring. By tranſplanting, the rows can be made more regular, and the intended diſtances more exactly obſerved; and conſequently the hoeing can be performed more perfectly, and with leſs expence. Mr Chateauvieux likewiſe tried the lucerne in ſingle beds three feet wide, with ſingle rows; in beds three feet nine inches wide, with double rows; and in beds four feet three inches wide, with triple rows. The plants in the ſingle rows were ſix inches aſunder, and thoſe in the double and triple rows were about eight or nine inches. In a courſe of three years he found, that a ſingle row produced more than a triple row of the ſame length. The plants of lucerne, when cultivated by tranſplantation, ſhould be at leaſt ſix inches aſunder, to allow them room for extending their crowns.

He further obſerves, that the beds or ridges ought to be raiſed in the middle; that a ſmall trench, two or three inches deep, ſhould be drawn in the middle; and that the plants ought to be ſet in this trench, covered with earth up to the neck. He ſays, that if the lucerne be ſown in ſpring, and in a warm ſoil, it will be ready for tranſplanting in September; that, if the weather be too hot and dry, the tranſplanting ſhould be delayed till October; and that, if the weather be unfavourable during both theſe months, this operation muſt be delayed till ſpring. He further directs, that the plants ſhould be carefully taken out of the nurſery, ſo as not to damage the roots; that the roots be left only about ſix or ſeven inches long; that the green crops be cut off within about two inches of the crown; that they be put into water as ſoon as taken up, there to remain till they are planted; and that they ſhould be planted with a planting-ſtick, in the ſame manner as cabbages.

He does not give particular directions as to the times of horſe-hoeing; but only ſays in general, that the intervals ſhould be ſtirred once in the month during the whole time that the lucerne is in a growing ſtate. He likewiſe obſerves, that great care ought to be taken not to ſuffer any weeds to grow among the plants, at leaſt for the firſt two or three years; and for this purpoſe, that the rows, as well as the edges of the intervals where the plough cannot go, ſhould be weeded by the hand.

184 Culture of burnet.

Burnet is peculiarly adapted to poor land; beſides, it proves an excellent winter-paſture when hardly any thing elſe vegetates. Other advantages are, It makes good butter; it never blows or ſwells cattle; it is fine paſture for ſheep; and will flouriſh well on poor, light, ſandy, or ſtony ſoils, or even on dry chalk hills.

The cultivation of it is neither hazardous nor expenfive. If the land is prepared as is generally done for turnips, there is no danger of its failing. After the firſt year, it will be attended with very little expence, as the flat circular ſpread of its leaves will keep down, or prevent the growth of weeds.

On the failure of turnips, either from the fly or the black worm, ſome of our farmers have ſown the land with burnet, and in March following had a fine paſture for their ſheep and lambs. It will perfect its ſeed twice in a ſummer; and this ſeed is ſaid to be as good as oats for horſes; but it is too valuable to be applied to that uſe.

It is ſometimes ſown late in the ſpring with oats and barley, and ſucceeds very well; but it is beſt to ſow it ſingly in the beginning of July, when there is a proſpect of rain, on a ſmall piece of land, and in October following, tranſplant it in rows two feet apart, and about a foot diſtant in the rows. This is a proper diſtance, and gives opportunity for hoeing the intervals in the ſucceeding ſpring and ſummer.

After it is fed down with cattle, it ſhould be harrowed clean. Some horſes will not eat it freely at firſt, but in two or three days they are generally very fond of it. It affords rich pleaſant milk, and in great plenty.

A gentleman farmer near Maidſtone ſome years ſince ſowed four acres as ſoon as the crop of oats were got off, which was the latter end of Auguſt. He threw in 12 pounds of ſeed per acre, broad-caſt; and no rain falling until the middle of September, the plants did not appear before the latter end of that month. There was however a good crop, and in the ſpring he ſet the plants out with a turnip-hoe, leaving them about a foot diſtant from each other. But the drill method is preferable, as it ſaves more than half the ſeed. The land was a poor dry gravel, not worth three ſhillings an acre for any thing elſe.

The ſevereſt froſt never injures the plant; and the oftener it is fed the thicker are its leaves, which ſpring conſtantly from its root.

SECT. V. *Rotation of Crops.*

185 Rotation of crops. No branch of huſbandry requires more ſkill and ſagacity than a proper rotation of crops, ſo as to keep the ground always in heart, and yet to draw out of it the greateſt profit poſſible. Some plants rob the ſoil, others are gentle to it: ſome bind, others looſen. The nice point is, to intermix crops, ſo as to make the greateſt profit conſiſtently with keeping the ground in trim. In that view, the nature of the plants employed in huſbandry muſt be accurately examined.

168 Culmiferous and leguminous plants. The difference between culmiferous and leguminous plants, is occaſionally mentioned above*. With reſpect to the preſent ſubject, a cloſer inſpection is neceſſary. Culmiferous plants, having ſmall leaves and few in number, depend moſtly on the ſoil for nouriſhment, and little on the air. During the ripening of the ſeed, they draw probably their whole nouriſhment from the ſoil; as the leaves by this time, being dry and withered, muſt have loſt their power of drawing nouriſhment from the air. Now, as culmiferous plants are chiefly cultivated for their ſeed, and are not cut down till the ſeed be fully ripe, they may be pronounced all of them to be robbers, ſome more, ſome leſs. But ſuch plants, while young, are all leaves; and in that ſtate draw moſt of their nouriſhment from the air. Hence it is, that where cut green for food to cattle, a culmiferous crop is far from being a robber. A hay-crop accordingly, even where it conſiſts moſtly of rye-graſs, is not a robber, provided it be cut before the ſeed is formed; which at any rate it ought to be, if one would have hay in perfection. And the foggage, excluding the froſt by covering the ground, keeps the roots warm. A leguminous plant, by its broad leaves, draws much of its nouriſhment from the air. A cabbage, which has very broad leaves, and a multitude of them, owes its growth more to the air than to the ſoil. One fact is certain, that a cabbage cut and hung up in a damp place, preſerves its verdure longer than other plants. At the ſame time, a ſeed is that part of a plant which requires the moſt nouriſhment; and for that nouriſhment a culmiferous plant muſt be indebted entirely to the ſoil. A leguminous crop, on the contrary, when cut green for food, muſt be very gentle to the ground. Peaſe and beans are leguminous plants; but being cultivated for ſeed, they ſeem to occupy a middle ſtation: their ſeed makes them more ſevere than other leguminous crops cut green; their leaves, which grow till reaping, make them leſs ſevere than a culmiferous plant left to ripen.

Theſe plants are diſtinguiſhed no leſs remarkably by the following circumſtance. All the ſeeds of a culmiferous plant ripen at the ſame time. As ſoon as they begin to form, the plant becomes ſtationary, the leaves wither, the roots ceaſe to puſh, and the plant when cut down is blanched and ſapleſs. The ſeeds of a leguminous plant are formed ſucceſſively: flowers and fruit appear at the ſame time in different parts of the plant. This plant accordingly is continually growing, and puſhing its roots. Hence the value of bean or peaſe ſtraw above that of wheat or oats: the latter is withered and dry when the crop is cut; the former, green and ſucculent. The difference therefore, with reſpect to the ſoil, between a culmiferous and leguminous crop, is great. The latter, growing till cut down, keeps the ground in conſtant motion, and leaves it to the plough looſe and mellow. The former gives over growing long before reaping; and the ground, by want of motion, turns compact and hard. Nor is this all. Dew falling on a culmiferous crop after the ground begins to harden, reſts on the ſurface, and is ſucked up by the next ſun. Dew that falls on a leguminous crop, is ſhaded from the ſun by the broad leaves, and ſinks at leiſure into the ground. The ground accordingly, after a culmiferous crop, is not only hard, but dry: after a leguminous crop, it is not only looſe, but ſoft and unctuous.

Of all culmiferous plants, wheat is the moſt ſevere, by the long time it occupies the ground without admitting a plough. And as the grain is heavier than that of barley or oats, it probably requires more nouriſhment than either. It is obſerved above, that as peaſe and beans draw part of their nouriſhment from the air by their green leaves while allowed to ſtand, they draw the leſs from the ground; and by their conſtant growing they leave it in good condition for ſubſequent crops. In both reſpects they are preferable to any culmiferous crop.

Culmiferous crops, as obſerved above, are not robbers when cut green: the ſoil, far from hardening, is kept in conſtant motion by the puſhing of the roots, and is left more tender than if it had been left at reſt without any bearing crop.

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* N° 120, 121.

Bulbous-rooted plants are above all ſucceſsful in dividing and pulverizing the ſoil. Potato-roots grow ſix, eight, or ten inches, under the ſurface; and, by their ſize and number, they divide and pulverize the ſoil better than can be done by the plough; conſequently, whatever be the natural colour of the ſoil, it is black when a potato-crop is taken up. The potato, however, with reſpect to its quality of dividing the ſoil, muſt yield to a carrot or parſnip; which are large roots, and pierce often to the depth of 18 inches. The turnip, by its tap-root, divides the ſoil more than can be done by a fibrous-rooted plant; but as its bulbous-root grows moſtly above ground, it divides the ſoil leſs than the potato, the carrot, or the parſnip. Red clover, in that reſpect, may be put in the ſame claſs with turnip.

Whether potatoes or turnip be the more gentle crop, appears a puzzling queſtion. The former bears ſeed, and probably draws more nouriſhment from the ſoil than the latter, when cut green. On the other hand, potatoes divide the ſoil more than turnip, and leave it more looſe and friable. It appears no leſs puzzling, to determine between cabbage and turnip: the former draws more of its nouriſhment from the air, the latter leaves the ſoil more free and open.

The reſult of the whole is what follows: Culmiferous plants are robbers; ſome more, ſome leſs: they at the ſame time bind the ſoil; ſome more, ſome leſs. Leguminous plants in both reſpects are oppoſite: if any of them rob the ſoil, it is in a very ſlight degree; and all of them without exception looſen the ſoil. A culmiferous crop, however, is generally the more profitable: but few ſoils can long bear the burden of ſuch crops, unleſs relieved by interjected leguminous crops. Theſe, on the other hand, without a mixture of culmiferous crops, would ſoon render the ſoil too looſe.

Theſe preliminaries will carry the farmer ſome length in directing a proper rotation of crops. Where dung, lime, or other manure, can be procured in plenty to recruit the ſoil after ſevere cropping, no rotation is more proper or profitable in a ſtrong ſoil, than wheat, peaſe or beans, barley, oats, fallow. The whole farm may be brought under this rotation, except ſo far as hay is wanted. But as ſuch command of manure is rare, it is of more importance to determine what ſhould be the rotation, when no manure can be procured but the dung collected in the farm. Conſidering that culmiferous crops are the more profitable in rich land, it would be proper to make them more frequent than the other kind. But as there are few ſoils that will admit ſuch frequent culmiferous crops without ſuffering, it may be laid down as a general rule, that alternate crops, culmiferous and leguminous, ought to form the rotation. Nor are there many ſoils that will ſtand good, even with this favourable rotation, unleſs relieved from time to time by paſturing a few years. If ſuch extended rotation be artfully carried on, crops without end may be obtained in a tolerable good ſoil, without any manure but what is produced in the farm.

187
The nature of ſoil conſidered, with regard to the rotation of crops.

It is ſcarce neceſſary to be mentioned, being known to every farmer, that clay anſwers beſt for wheat, moiſt clay for beans, loam for barley and peaſe, light ſoil for turnip, ſandy ſoil for rye and buck-wheat; and that oats thrive better in coarſe ſoil than any other grain. Now, in directing a rotation, it is not ſufficient that a culmiferous crop be always ſucceeded by a leguminous: attention muſt alſo be given, that no crop be introduced that is unfit for the ſoil. Wheat, being a great binder, requires more than any other crop a leguminous crop to follow. But every ſuch crop is not proper: potatoes are the greateſt openers of ſoil; but they are improper in a wheat ſoil. Neither will turnip anſwer, becauſe it requires a light ſoil. A very looſe ſoil, after a crop of rye, requires rye-graſs to bind it, or the treading of cattle in paſturing: but to bind the ſoil, wheat muſt not be ventured; for it ſucceeds ill in looſe ſoil.

Another conſideration of moment in directing the rotation, is to avoid crops that encourage weeds. Peaſe is the fitteſt of all crops for ſucceeding to wheat, becauſe it renders the ground looſe and mellow, and the ſame ſoil agrees with both. But beware of peaſe, unleſs the ſoil be left by the wheat perfectly free of weeds; becauſe peaſe, if not an extraordinary crop, foſter weeds. Barley may be ventured after wheat, if the farmer be unwilling to loſe a crop. It is indeed a robber; better, however, any crop, than run the hazard of poiſoning the ſoil with weeds. But to prevent the neceſſity of barley after wheat, the land ought to be fallowed before the wheat: it cleans the ground thoroughly, and makes peaſe a ſecure crop after wheat. And after a good crop of peaſe, barley never fails. A horſe-hoed crop of turnip is equal to a fallow for rooting out weeds; but turnip does not ſuit land that is proper for wheat. Cabbage does well in wheat ſoil: and a horſe-hoed crop of cabbage, which eradicates weeds, is a good preparation for wheat to be ſucceeded by peaſe; and a crop of beans diligently hand-hoed, is in that view little inferior. As red clover requires the ground to be perfectly clean, a good crop of it enſures wheat, and next peaſe. In loam, a drilled crop of turnip or potatoes prepares the ground, equal to a fallow, for the ſame ſucceſſion.

Another rule is, to avoid a frequent repetition of the ſame ſpecies; for to produce good crops, change of ſpecies is no leſs neceſſary than change of ſeed. The ſame ſpecies returning every ſecond or third year, will infallibly degenerate, and be a ſcanty crop. This is remarkably the caſe of red clover. Nor will our fields bear pleaſantly perpetual crops of wheat after fallow, which is the practice of ſome Engliſh farmers.

Hitherto of rotation in the ſame field. We add one rule concerning rotation in different fields; which is, to avoid crowding crops one after another in point of time; but to chooſe ſuch as admit intervals ſufficient for leiſurely dreſſing, which gives opportunity to manage all with the ſame hands, and with the ſame cattle; for example, beans in January or February, peaſe and oats in March, barley and potatoes in April, turnips in June or July, wheat and rye in October.

188
Exceptionable rotations.

For illuſtrating the foregoing rules, a few inſtances of exceptionable rotations will not be thought amiſs. The following is an uſual rotation in Norfolk. Firſt, wheat after red clover. Secondly, barley. Third, turnip. Fourth, barley with red clover. Fifth, clover cut for hay. Sixth, a ſecond year's crop of clover commonly paſtured. Dung is given to the wheat and turnip.—Againſt this rotation ſeveral objections lie. Barley after wheat is improper. The two crops of barley are too near together. The ſecond crop of clover muſt be very bad, if paſturing be the beſt way of conſuming it; and if bad, is a great encourager of weeds. But the ſtrongeſt objection is, that red clover repeated ſo frequently in the ſame field cannot fail to degenerate; and of this the Norfolk farmers begin to be ſenſible.—Salton in Eaſt Lothian is a clay ſoil; and the rotation there is, wheat after fallow and dung. Second, barley after two ploughings; the one before winter, the other immediately before the ſeed is ſown. Third, oats. Fourth, peaſe. Fifth, barley. Sixth, oats: and then fallow. This rotation conſiſts chiefly of robbing crops. Peaſe are the only leguminous crop, which even with the fallow is not ſufficient to looſen a ſtiff ſoil. But the ſoil is good, which in ſome meaſure hides the badneſs of the rotation.—About Seaton, and all the way from Preſton to Goſford, the ground is ſtill more ſeverely handled: wheat after fallow and dung, barley, oats, peaſe, wheat, barley, oats, and then another fallow. The ſoil is excellent; and it ought indeed to be ſo, to ſupport many rounds of ſuch cropping.

In the pariſhes of Tranent, Aberlady, Dirleton, North-Berwick, and Athelſtonefoord, the following rotations were formerly univerſal, and to this day are much more frequent than any other mode.

1. After fallow with dung, wheat, barley, oats, peaſe and beans, barley, oats, wheat.

2. After fallow and dung, barley, oats, peaſe and beans, wheat, barley, oats, peaſe, wheat.

3. After fallow and dung, wheat, oats, peaſe, barley, oats, wheat.

4. After fallow and dung, barley, oats, beans, wheat, peaſe, barley, oats.

In the ſeveral Tours of Young, the itinerant farmer, are found, in the beſt counties of England, examples without end, of rotations no leſs exceptionable than many of thoſe mentioned.

189
Fields not to be kept too long in paſture.

Where a field is laid down for paſture in order to be recruited, it is commonly left in that ſtate many years; for it is the univerſal opinion, that the longer it lies, the richer it becomes for bearing corn. This may be true; but in order to determine the mode of cropping, the important point is, what upon the whole is the moſt profitable rotation; not what may produce luxuriant crops at a diſtant period. Upon that point, it may be affirmed, that the farmer who keeps a field in paſture beyond a certain time, loſes every year conſiderably; and that a few luxuriant crops of corn, after 20 years of paſture, and ſtill more after 30, will not make up the loſs.

Paſture-graſs, while young, maintains many animals, and the field is greatly recruited by what they drop; it is even recruited by hay crops, provided the graſs be cut before feeding. But as old graſs yields little profit, the field ought to be taken up for corn when the paſture begins to fail; and after a few crops, it ought to be laid down again with graſs-ſeeds. Seduced by a chimerical notion, that a field, by frequent corn-crops, is fatigued, and requires reſt like a labouring man or animal, careful farmers give long reſt to their fields by paſture, never adverting that it affords little profit. It ought to be their ſtudy, to improve their ſoil, by making it free, and alſo retentive of moiſture. If they accompliſh theſe ends, they need not be afraid of exhauſting the ſoil by cropping.

190
Examples of rotations.

Where a farmer has acceſs to no manure but what is his own production, the caſe under conſideration, there are various rotations of crops, all of them good, though perhaps not equally ſo. We ſhall begin with two examples, one in clay, and one in free ſoil, each of the farms 90 acres. Six acres are to be incloſed for a kitchen-garden in which there muſt be annually a crop of red clover, for ſummer-food to the working cattle. As there are annually 12 acres in hay, and 12 in paſture, a ſingle plough with good cattle will be ſufficient to command the remaining 60 acres.

Rotation in a clay ſoil.

Incloſ.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Fallow.	Wheat.	Peaſe.	Barley.	Hay.	Oats.
2.	Wheat.	Peaſe.	Barley.	Hay.	Oats.	Fallow.
3.	Peaſe.	Barley.	Hay.	Oats.	Fallow.	Wheat.
4.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Peaſe.
5.	Hay.	Oats.	Fallow.	Wheat.	Peaſe.	Barley.
6.	Oats.	Fallow.	Wheat.	Peaſe.	Barley.	Hay.
7.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.

When the rotation is completed, the ſeventh incloſure having been ſix years in paſture, is ready to be taken up for a rotation of crops which begins with oats in the year 1781, and proceeds as in the ſixth incloſure. In the ſame year 1781, the fifth incloſure is made paſture, for which it is prepared by ſowing paſture graſs ſeeds with the barley of the year 1780. And in this manner may the rotation be carried on without end. Here the labour is equally diſtributed; and there is no hurry nor confuſion. But the chief property of this rotation is, that two culmiferous or white-corn crops are never found together; by a due mixture of crops, the ſoil is preſerved in good heart without any adventitious manure. At the ſame time, the land is always producing plentiful crops; neither hay nor paſture get time to degenerate. The whole dung is laid upon the fallow.

Every farm that takes a graſs-crop into the rotation muſt be incloſed, which is peculiarly neceſſary in a clay ſoil, as nothing is more hurtful to clay than poaching.

Rotation in a free ſoil.

Incloſ.	1775.	1776.	1777.	1778.	1779.	1780.
1.	Turnip.	Barley.	Hay.	Oats.	Fallow.	Wheat.
2.	Barley.	Hay.	Oats.	Fallow.	Wheat.	Turnip.
3.	Hay.	Oats.	Fallow.	Wheat.	Turnip.	Barley.
4.	Oats.	Fallow.	Wheat.	Turnip.	Barley.	Hay.
5.	Fallow.	Wheat.	Turnip.	Barley.	Hay.	Oats.
6.	Wheat.	Turnip.	Barley.	Hay.	Oats.	Fallow.
7.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.	Paſture.

For the next rotation, the ſeventh incloſure is taken up for corn, beginning with an oat-crop, and proceeding in the order of the fourth incloſure; in place of which, the third incloſure is laid down for paſture by ſowing paſture-graſſes with the laſt crop in that incloſure, being barley. This rotation has all the advantages

Practice. ges of the former. Here the dung is employed on the turnip-crop.

We proceed to conſider what rotation is proper for carſe clay. The farm we propoſe conſiſts of 73 acres. Nine are to be incloſed for a kitchen garden, affording plenty of red clover to be cut green for the farm-cattle, The remaining 64 acres are divided into four incloſures, 16 acres each, to be cropped as in the following table.

Incloſ.	1775.	1776.	1777.	1778.
1.	Beans.	Barley.	Hay.	Oats.
2.	Barley.	Hay.	Oats.	Beans.
3.	Hay.	Oats.	Beans.	Barley.
4.	Oats.	Beans.	Barley.	Hay.

Here the dung ought to be applied to the barley.

Many other rotations may be contrived, keeping to the rules above laid down. Fallow, for example, wheat, peaſe and beans, barley, cabbage, oats, for clay. Here dung muſt be given both to the wheat and cabbage. For free ſoil, drilled turnip, barley, red clover, wheat upon a ſingle furrow, drilled potatoes, oats. Both the turnip and potatoes muſt have dung. Another for free ſoil: turnip drilled and dunged, red clover, wheat, on a ſingle furrow with dung, peaſe, barley, potatoes, oats. The following rotation has proved ſucceſsful in a ſoil proper for wheat. 1. Oats with red clover, after fallow, without dung. 2. Hay. The clover-ſtubble dunged, and wheat ſown the end of October with a ſingle furrow. 3. Wheat. 4. Peaſe. 5. Barley. Fallow again. Oats are taken the firſt crop, to ſave the dung for the wheat. Oats always thrive on a fallow, though without dung, which is not the caſe of barley. But barley ſeldom fails after peaſe. In ſtrong clay ſoil, the following rotation anſwers. 1. Wheat after fallow and dung. 2. Beans ſown under fallow as early as poſſible. Above the beans, ſow peaſe end of March, half a boll per acre, and harrow them in. The two grains will ripen at the ſame time. 3. Oats or barley on a winter furrow with graſs-ſeeds. 4. Hay for one year or two; the ſecond growth paſtured. Lay what dung can be ſpared on the hay ſtubble, and ſow wheat with a ſingle furrow. 5. Wheat. 6. Beans or peaſe. 7. Oats. Fallow again.

SECT. VI. *Of Reaping Corn and Hay Crops, and Storing them up for uſe.*

191 ripeneſs. CULMIFEROUS plants are ripe when the ſtem is totally white: they are not fully ripe if any green ſtreaks remain. Some farmers are of opinion, that wheat ought to be cut before it is fully ripe. Their reaſons are, firſt, that ripe wheat is apt to ſhake; and next, that the flour is not ſo good. With reſpect to the laſt, it is contrary to nature, that any ſeed can be better in an unripe ſtate than when brought to perfection: nor will it be found ſo upon trial. With reſpect to the firſt, wheat, at the point of perfection, is not more apt to ſhake than for ſome days before; the huſk begins not to open till after the ſeed is fully ripe; and then the ſuffering the crop to ſtand becomes ticklifh: after the minute of ripening, it ſhould be cut down in an inſtant, if poſſible.

Practice. 192 Of reapers. This leads to the hands that are commonly engaged to cut down corn. In Scotland, the univerſal practice was, to provide a number of hands, in proportion to the extent of the crop, without regard to the time of reaping. By this method, the reapers were often idle for want of work; and what is much worſe, they had often more work than they could overtake, and ripe fields were laid open to ſhaking winds. The Lothians have long enjoyed weekly markets for reapers, where a farmer can provide himſelf with the number he wants; and this practice is creeping into neighbouring ſhires. Where there is no opportunity of ſuch markets, neighbouring farmers ought to agree in borrowing and lending their reapers.

One ſhould imagine, that a caution againſt cutting corn when wet is unneceſſary; yet from the impatience of farmers to prevent ſhaking, no caveat is more ſo. Why do they not conſider, that corn ſtanding dries in half a day; when, in a cloſe ſheaf, the weather muſt be favourable if it dry in a month? in moiſt weather it will never dry.

193 Manner of cutting. With reſpect to the manner of cutting, we muſt premiſe, that barley is of all the moſt difficult grain to be dried for keeping. Having no huſk, rain has eaſy acceſs; and it has a tendency to malten when wet. Where the ground is properly ſmoothed by rolling, it ſeems beſt to cut it down with the ſcythe. This manner being more expeditious than the ſickle, removes it ſooner from danger of wind; and gives a third more ſtraw, which is a capital article for dung, where a farm is at a diſtance from other manure. We except only corn that has lodged; for there the ſickle is more convenient than the ſcythe. As it ought to be dry when cut, bind it up directly: if allowed to lie any time in the ſwath, it is apt to be diſcoloured.—Barley ſown with graſs-ſeeds, red clover eſpecially, requires a different management. Where the graſs is cut along with it, the difficulty is great of getting it ſo dry as to be ventured in a ſtack. The beſt way is, to cut the barley with a ſickle above the clover, ſo as that nothing but clean barley is bound up. Cut with a ſcythe the ſtubble and graſs: they make excellent winter food. The ſame method is applicable to oats; with this only difference, that when the field is expoſed to the ſouth-weſt wind, it is leſs neceſſary to bind immediately after mowing. As wheat commonly grows higher than any other grain, it is difficult to manage it with the ſcythe; for which reaſon the ſickle is preferred in England. Peaſe and beans grow ſo irregularly, as to make the ſickle neceſſary.

194 Drying of peaſe. The beſt way for drying peaſe, is to keep ſeparate the handfuls that are cut: though in this way they wet eaſily, they dry as ſoon. In the common way of heaping peaſe together for compoſing a ſheaf, they wet as eaſily, and dry not near ſo ſoon. With reſpect to beans, the top of the handful laſt cut, ought to be laid on the bottom of the former; which gives ready acceſs to the wind. By this method peaſe and beans are ready for the ſtack in half the ordinary time.

195 Size of ſheaves. A ſheaf commonly is made as large as can be contained in two lengths of the corn made into a rope. To ſave frequent tying, the binder preſſes it down with his knee, and binds it ſo hard as totally to exclude the air. If there be any moiſture in the crop, which ſeldom fails, a proceſs of fermentation and putrefaction commences

in the ſheaf; which is perfected in the ſtack, to the deſtruction both of corn and ſtraw. How ſtupid is it, to make the ſize of a ſheaf depend on the height of the plants! By that rule, a wheat-ſheaf is commonly ſo weighty, as to be unmanageable by ordinary arms: it requires an effort to move it, that frequently burſts the knot, and occaſions loſs of grain, beſides the trouble of a ſecond tying. Sheaves ought never to be larger than can be contained in one length of the plant, cut cloſe to the ground; without admitting any exception, if the plants be above eighteen inches high. The binder's arms can then compreſs the ſheaf ſufficiently, without need of his knee. The additional hands that this way of binding may require, are not to be regarded, compared with the advantage of drying ſoon. Corn thus managed may be ready for the ſtack in a week; it ſeldom in the ordinary way requires leſs than a fortnight, and frequently longer. Of a ſmall ſheaf compreſſed by the arm only, the air pervades every part; nor is it ſo apt to be unlooſed as a large ſheaf, however firmly bound. We omit the gathering of ſheaves into ſhocks, becauſe the common method is good, which is to place the ſhocks directed to the ſouth-weſt, in order to reſiſt the force of the wind. Five ſheaves on each ſide make a ſufficient ſtay; and a greater number cannot be covered with two head-ſheaves.

196
Carrying off the victual.

Every article is of importance that haſtens the operation in a country ſubjected to unequal harveſt-weather; for which reaſon, the moſt expeditious method ſhould be choſen for carrying the corn from the field to the ſtack-yard. Our carriages are generally too ſmall or too large. A ſledge is a very aukward machine: many hands are required, and little progreſs made. Waggons and large carts are little leſs dilatory, as they muſt ſtand in the yard till unloaded ſheaf by ſheaf. The beſt way is, to uſe long carts moveable upon the axle, ſo as at once to throw the whole load on the ground; which is forked up to the ſtack by a hand appointed for that purpoſe. By this method, two carts will do the work of four or five.

197
Of ſtacking

Building round ſtacks in the yard is undoubtedly preferable to houſing corn. There it is ſhut up from the air; and it muſt be exceedingly dry, if it contract not a muſtineſs, which is the firſt ſtep to putrefaction. Add to this, that in the yard, a ſtack is preſerved from rats and mice by being ſet on a pedeſtal; whereas no method has hitherto been invented for preſerving corn in a houſe from ſuch deſtructive vermin. The proper manner of building, is to make every ſheaf incline downward from its top to its bottom. Where the ſheaves are laid horizontally, the ſtack will take in rain both above and below. The beſt form of a ſtack is that of a cone placed on a cylinder; and the top of the cone ſhould be formed with three ſheaves drawn to a point. If the upper part of the cylinder be a little wider than the under, ſo much the better.

198
Covering the ſtacks.

The delaying to cover a ſtack for two or three weeks, though common, is, however, exceedingly abſurd; for if much rain fall in the interim, it is beyond the power of wind to dry the ſtack. Vegetation begun in the external parts, ſhuts out the air from the internal; and to prevent a total putrefaction, the ſtack muſt be thrown down, and expoſed to the air, every ſheaf. In order to have a ſtack covered the moment it is finiſhed, ſtraw and ropes ought to be ready; and the covering ought to be ſo thick as to be proof againſt rain.

Scotland is ſubject not only to floods of rain, but to high winds. Good covering guards againſt the former, and ropes artfully applied guards againſt the latter. The following is a good mode. Take a hay-rope well twiſted, and ſurround the ſtack with it, two feet or ſo below the top. Surround the ſtack with another ſuch rope immediately below the eaſing. Connect theſe two with ropes in an up-and-down poſition, diſtant from each other at the eaſing about five or ſix feet. Then ſurround the ſtack with other circular ropes parallel to the two firſt mentioned, giving them a twiſt round every one of theſe that lie up and down, by which the whole will be connected together in a ſort of net-work. What remains is, to finiſh the two feet at the top of the ſtack. Let it be covered with bunches of ſtraw laid regularly up and down; the under part to be put under the circular rope firſt mentioned, which will keep it faſt, and the upper part be bound by a ſmall rope artfully twiſted, commonly called *the crown of the ſtack*. This method is preferable to the common way of laying long ropes over the top of the ſtack, and tying them to the belting-rope; which flattens the top, and makes it take in rain. A ſtack covered in the way here deſcribed, will ſtand two years ſecured both againſt wind and rain; a notable advantage in a variable climate.

199
Hay-making.

The great aim in making hay is, to preſerve as much of the ſap as poſſible. All agree in this; and yet differ widely in the means of making that aim effectual. To deſcribe all the different means would be equally tedious and unprofitable. We ſhall confine ourſelves to two, which appear preferable to all others. A crop of rye-graſs and yellow clover ought to be ſpread as cut. A day or two after, when the dew is evaporated, rake it into a number of parallel rows along the field, termed *wind-rows*, for the convenience of putting it up into ſmall cocks. After turning the rows once and again, make ſmall cocks weighing a ſtone or two. At the diſtance of two days or ſo, put two cocks into one, obſerving always to mix the tops and bottoms together, and to take a new place for each cock, that the leaſt damage poſſible may be done to the graſs. Proceed in putting two cocks into one, till ſufficiently dry for tramp-ricks of 100 ſtone each. The eaſieſt way of erecting tramp-ricks, is to found a rick in the middle of the row of cocks that are to compoſe it. The cocks may be carried to the rick by two perſons joining arms together. When all the cocks are thus carried to the rick within the diſtance of 40 yards or ſo, the reſt of the cocks will be more expeditiouſly carried to the rick, by a rope wound about them and dragged by a horſe. Two ropes are ſufficient to ſecure the ricks from wind the ſhort time they are to ſtand in the field. In the year 1775, 10,000 ſtone were put into tramp-ricks the fourth year after cutting. In a country ſo wet as many parts of Scotland are, expedition is of mighty conſequence in the drying both of hay and corn. With reſpect to hay intended for horned cattle, it is by the generality held an improvement, that it be heated a little in the ſtack. But we violently ſuſpect this doctrine to have been invented for excuſing indolent management. An ox, it is true, will eat ſuch hay; but it will always be found that he prefers ſweet hay; and it cannot well be doubted, but that ſuch hay is the moſt ſalutary and the moſt nouriſhing.

200 Hay of red clover.

The making hay conſiſting chiefly of red clover, requires more care. The ſeaſon of cutting is the laſt week of June, when it is in full bloom; earlier it may be cut, but never later. To cut it later would indeed produce a weightier crop; but a late firſt cutting makes the ſecond alſo late, perhaps too late for drying. At the ſame time, the want of weight in an early firſt cutting, is amply compenſated by the weight of the ſecond.

When the ſeaſon is too variable for making hay of the ſecond growth, mix ſtraw with that growth, which will be a ſubſtantial food for cattle during winter. This is commonly done by laying ſtrata of the ſtraw and clover alternately in the ſtack. But by this method, the ſtrata of clover, if they do not heat, turn mouldy at leaſt, and unpalatable. The better way is, to mix them carefully with the hand before they be put into the ſtack. The dry ſtraw imbibes moiſture from the clover and prevents heating.

201 Other method.

But the beſt method of hay-making ſeems to be that recommended by Mr Anderſon.* "Inſtead," ſays he, "of allowing the hay to lie, as uſual in moſt places, for ſome days in the ſwathe after it is cut, and afterwards alternately putting it up into cocks and ſpreading it out, and tedding it in the ſun, which tends greatly to bleach the hay, exhales its natural juices, and ſubjects it very much to the danger of getting rain, and thus runs a great riſk of being good for little, I make it a general rule, if poſſible, never to cut hay but when the graſs is quite dry; and then make the gatherers follow cloſe upon the cutters,—putting it up immediately into ſmall cocks about three feet high each when new put up, and of as ſmall a diameter as they can be made to ſtand with; always giving each of them a ſlight kind of thatching, by drawing a few handfuls of the hay from the bottom of the cock all around, and laying it lightly upon the top with one of the ends hanging downwards. This is done with the utmoſt eaſe and expedition; and when it is once in that ſtate, I conſider my hay as in a great meaſure out of danger: for unleſs a violent wind ſhould ariſe immediately after the cocks are put up, ſo as to overturn them, nothing elſe can hurt the hay; as I have often experienced, that no rain, however violent, ever penetrates into theſe cocks but for a very little way. And, if they are dry put up, they never ſit together ſo cloſely as to heat; although they acquire, in a day or two, ſuch a degree of firmneſs, as to be in no danger of being overturned by wind after that time, unleſs it blows a hurricane.

* *Eſſays on Agriculture.* Vol. I. p. 186

"In theſe cocks I allow the hay to remain, until, upon inſpection, I judge that it will keep in pretty large tramp-cocks (which is uſually in one or two weeks, according as the weather is more or leſs favourable), when two men, each with a long pronged pitchfork, lift up one of theſe ſmall cocks between them with the greateſt eaſe, and carry them one after another to the place where the tramp-cock is to be built (A): and in this manner they proceed over the field till the whole is finiſhed.

202 Advantages of this method.

"The advantages that attend this method of making hay, are, That it greatly abridges the labour; as it does not require above the one-half of the work that is neceſſary in the old method of turning and tedding it: That it allows the hay to continue almoſt as green as when it is cut, and preſerves its natural juices in the greateſt perfection; for, unleſs it be the little that is expoſed to the ſun and air upon the ſurface of the cocks, which is no more bleached than every ſtraw of hay ſaved in the ordinary way, the whole is dried in the moſt ſlow and equal manner that could be deſired: and, laſtly, That it is thus in a great meaſure ſecured from almoſt the poſſibility of being damaged by rain. This laſt circumſtance deſerves to be much more attended to by the farmer than it uſually is at preſent; as I have ſeen few who are ſufficiently aware of the loſs that the quality of their hay ſuſtains by receiving a ſlight ſhower after it is cut, and before it is gathered; the generality of farmers ſeeming to be very well ſatisfied if they get in their hay without being abſolutely rotted; never paying the leaſt attention to its having been ſeveral times wetted while the hay was making. But, if theſe gentlemen will take the trouble at any time to compare any parcel of hay that has been made perfectly dry, with another parcel from the ſame field that has received a ſhower while in the ſwathe, or even a copious dew, they will ſoon be ſenſible of a very manifeſt difference between them; nor will their horſes or cattle ever commit a miſtake in chooſing between the two.

203 Particular caution requiſite in this method

"Let it be particularly remarked, that in this manner of making hay, great care muſt be taken that it be dry when firſt put into the cocks; for, if it is in the leaſt degree wet at that time, it will turn inſtantly mouldy, and ſit together ſo as to become totally impervious to the air, and will never afterwards become dry till it is ſpread out to the ſun. For this reaſon, if at any time during a courſe of good ſettled weather you ſhould begin to cut in the morning before the dew is off the graſs, keep back the gatherers till the dew is evaporated; allowing that which was firſt cut to lie till it is dry before it is cocked. In this caſe, you will almoſt always find that the uncut graſs will dry ſooner than that which has been cut when wet; and, therefore, the gatherers may always begin to put up that which is freſh cut before the other; which will uſually require two or three hours to dry after the new-cut hay may be cocked. And if, at any time, in caſe of neceſſity, you ſhould be obliged to cut your hay before it is dry, the ſame rule muſt be obſerved, always to allow it to remain in the ſwathe till it is quite dry: but, as there is always a great riſk of being long in getting it

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(A) If the hay is to be carried to any conſiderable diſtance, this part of the labour may be greatly abridged, by cauſing the carriers take two long ſticks of a ſufficient ſtrength, and having laid them down by the ſmall cocks parallel to one another, at the diſtance of one and a half, or two feet aſunder, let them lift three or four cocks, one after another, and place them carefully above the ſticks, and then carry them altogether, as if upon a hand-barrow, to the place where the large rick is to be built.

up, and as it never in this caſe *wins* (A) ſo kindly as if it had been dry cut, the farmer ought to endeavour, if poſſible, in all caſes, to cut his hay only when dry; even if it ſhould coſt him ſome additional expence to the cutters, by keeping them employed at any other work, or even allowing them to remain idle, if the weather ſhould be variable or rainy.

“ But if there is a great proportion of clover, and the weather ſhould chance to be cloſe and calm at the time, it may, on ſome occaſions, be neceſſary to open up theſe cocks a little, to admit ſome freſh air into them; in which caſe, after they have ſtood a day or two, it may be of great uſe to turn theſe cocks and open them up a little, which ought to be done in the drieſt time of the day; the operator taking that part of each cock which was the top, and with it forming the baſe of a new one; ſo that the part which was moſt expoſed to the air becomes excluded from it, and that which was undermoſt comes to be placed upon the top, ſo as to make it all dry as equally as poſſible.

“ If the hay has not been damp when it was firſt put up, the cock may be immediately finiſhed out at once; but if it is at all wet, it will be of great uſe to turn over only a little of the top of the cock at firſt, and leaving it in that ſtate to dry a little, proceed to another, and a third, and fourth, &c. treating each in the ſame way; going on in that manner till you find that the inſide of the firſt opened cock is ſufficiently dried, when it will be proper to return to it, turning over a little more of it till you come to what is ſtill damp, when you leave it and proceed to another, and ſo on round the whole; always returning afreſh till the cocks are entirely finiſhed. This is the beſt way of ſaving your hay, if you have been under the neceſſity of cutting it while damp; but it is always beſt to guard againſt this inconvenience, if poſſible.”

204 Hay-ſtacks. In the yard, a ſtack of hay ought to be an oblong ſquare, if the quantity be greater than to be eaſily ſtowed in a round ſtack; becauſe a ſmaller ſurface is expoſed to the air, than in a number of round ſtacks. For the ſame reaſon, a ſtack of peaſe ought to have the ſame form, the ſtraw being more valuable than that of oats, wheat, or barley. The moment a ſtack is finiſhed, it ought to be covered; becauſe the ſurface-hay is much damaged by withering in dry weather, and moiſtening in wet weather. Let it have a pavilion-roof; for more of it can be covered with ſtraw in that ſhape, than when built perpendicular at the ends. Let it be roped as directed above for corn-ſtacks; with this difference only, that in an oblong ſquare the ropes muſt be thrown over the top, and tied to the belt-rope below. This belt-rope ought to be fixed with pins to the ſtack: the reaſon is, that the ropes thrown over the ſtack will bag by the ſinking of the ſtack, and may be drawn tight by lowering the belt-rope, and fixing it in its new poſition with the ſame pins.

The ſtems of hops, being long and tough, make excellent ropes; and it will be a ſaving article, to propagate a few plants of that kind for that very end.

A ſtack of rye-graſs hay, a year old, and of a moderate ſize, will weigh, each cubic yard, 11 Dutch ſtone. A ſtack of clover-hay in the ſame circumſtances weighs ſomewhat leſs.

SECT. VII. *Manures.*

The manures commonly uſed are dung, lime, ſhell-marle, clay-marle, and ſtone-marle. Many other ſubſtances are uſed; ſhavings of horn, for example, refuſe of malt, and even old rags: but as the quantity that can be procured is inconſiderable, and as their application is ſimple, we ſhall conſume no time upon them.

Dung is the chief of all manures; becauſe a quantity of it may be collected in every farm, and becauſe it makes the quickeſt return. A field ſufficiently dunged will produce good crops four or five years.

Dung of animals that chew the cud, being more thoroughly putrefied than that of others, is fit to be mixed with the ſoil without needing to be collected into a dunghill. A horſe does not chew the cud; and in horſe-dung may be perceived ſtraw or rye-graſs broken into ſmall parts, but not diſſolved: it is proper therefore that the putrefaction be completed in a dunghill. It ought to be mixed there with cool materials: ſo hot it is, that, in a dunghill by itſelf, it ſinges and burns inſtead of putrefying. The difference between the dung of a horſe and of a horned animal, is viſible in a paſture-field: the graſs round the former is withered; round the latter, it is ranker and more verdant than in the reſt of the field. A mixture of dry and moiſt ſtuff ought to be ſtudied: the former attracting moiſture from the latter, they become equally moiſt. 205 Dung.

To prevent ſap from running out of a dunghill, its ſituation ſhould be a little below the ſurface; and to prevent rain from running into it, it ſhould be ſurrounded with a ring of ſod. If the ſoil on which the dunghill ſtands be porous, let it be paved, to prevent the ſap from ſinking into the ground. If moiſture happen to ſuperabound, it may be led off by a ſmall gutter to impregnate a quantity of rich mould laid down to receive it, which will make it equal to good dung. 206 Of a dunghill.

Straw ſhould be prepared for the dunghill, by being laid under cattle, and ſufficiently moiſtened. When laid dry into a dunghill, it keeps it open, admits too much air, and prevents putrefaction.

Dung from the ſtable ought to be carefully ſpread on the dunghill, and mixed with the former dung. When left in heaps upon the dunghill, fermentation and putrefaction go on unequally.

Complete putrefaction is of importance with regard to the ſeed of weeds that are in the dunghill: if they remain ſound, they are carried out with the dung, and infeſt the ground. Complete putrefaction is of ſtill greater importance by pulverizing the dung; in which condition it mixes intimately with the ſoil, and operates the moſt powerfully. In land intended for barley, undigeſted dung has a very bad effect: it keeps the ground open, admits drought, and prevents the ſeed from ſpringing. On the other hand, when thoroughly rotted, it mixes with the ſoil, and enables it to retain moiſture. It follows, that the propereſt time for dunging a field, is,

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(A) By *winning* hay, is meant the operation by which it is brought from the ſucculent ſtate of graſs to that of a dry fodder.

207 Time for dunging.

is, in its higheſt pulverization; at which time the earth mixes intimately with the dung. Immediately before ſetting cabbage, ſowing turnip, or wheat, is a good time. Dung divides and ſpreads the moſt accurately when moiſt. Its intimate mixture with the ſoil is of ſuch importance, that hands ſhould be employed to divide and ſpread any lumps that may be in it.

208 Manner of dunging.

Dung ſhould be ſpread, and ploughed into the ground without delay. When a heap lies two or three weeks, ſome of the moiſture is imbibed into the ground, which will produce tufts of corn more vigorous than in the reſt of the field. There cannot be a worſe practice than to lead out dung before winter, leaving it expoſed to froſt and ſnow. The whole ſpirit of the dung is extracted by rain, and carried off with it. The dung diveſted of its ſap becomes dry in ſpring, and incapable of being mixed with the mould. It is turned over whole by the plough, and buried in the furrow.

209 Of collecting dung.

As dung is an article of the utmoſt importance in huſbandry, one ſhould imagine, that the collecting it would be a capital article with an induſtrious farmer. Yet an ingenious writer, obſerving that the Jamaicans are in this particular much more induſtrious than the Britiſh, aſcribes the difference to the difficulty of procuring dung in Jamaica. "In England, where the long winter enables a farmer to raiſe what quantity he pleaſes, it is not collected with any degree of induſtry. But in Jamaica, where there is no winter, and where the heat of the ſun is a great obſtruction, the farmer muſt be indefatigable, or he will never raiſe any dung." Cool intereſt is not alone a ſufficient motive with the indolent, to be active. As dung is of great importance in huſbandry, a farmer cannot be too aſſiduous in collecting animal and vegetable ſubſtances that will rot. One article of that kind there is, to collect which there is a double motive, and yet is neglected almoſt every where. A farm full of weeds is a nuiſance to the neighbourhood: it poiſons the fields around; and the poſſeſſor ought to be diſgraced as a peſt to ſociety. Now, the cutting down every weed before the ſeed is formed, anſwers two excellent purpoſes. Firſt, it encourages good crops, by keeping the ground clean. Next, theſe weeds, mixed with other materials in a dunghill, may add conſiderably to the quantity of dung.

210 Of lime.

Next of lime, which is a profitable manure, and greatly ſo when it can be got in plenty within a moderate diſtance. The benefit of lime is ſo viſible, that the uſe of it has become general, where the price and carriage are in any degree moderate.

211 Its operation.

However people may differ in other particulars, all agree, that the operation of lime depends on its intimate mixture with the ſoil: and therefore that the proper time of applying it, is when it is perfectly powdered and the ſoil at the ſame time in the higheſt degree of pulverization. Lime of itſelf is abſolutely barren; and yet it enriches a barren ſoil. Neither of the two produces any good effect without the other: and conſequently, the more intimately they are mixed, the effect muſt be the greater.

Hence it follows, that lime ought always to be ſlaked with a proper quantity of water, becauſe by that means it is reduced the moſt effectually into powder. Lime left to be ſlaked by a moiſt air, or accidental rain, is ſeldom or never thoroughly reduced into powder; and therefore can never be intimately mixed with the ſoil. Sometimes an opportunity offers to bring home ſhell-lime before the ground is ready for it; and it is commonly thrown into a heap without cover, truſting to rain for ſlaking. The proper way is, to lay the ſhell-lime in different heaps on the ground where it is to be ſpread, to reduce theſe heaps into powder by ſlaking it with water, and to cover the ſlaked lime with ſod ſo as to defend it from rain. One however ſhould avoid as much as poſſible the bringing home lime before the ground be ready for it. Where allowed to lie long in a heap, there are two bad conſequences: firſt, lime attracts moiſture, even though well covered, and runs into clots, which prevents an intimate mixture; and, next, we know, that burnt limeſtone, whether in ſhells or in powder, returns gradually into its original ſtate of limeſtone; and upon that account alſo, is leſs capable of being mixed with the ſoil. And this is verified by a fact, that, after lying long, it is ſo hard bound together as to require a pick to ſeparate the parts.

For the ſame reaſon, it is a bad practice, though common, to let ſpread lime lie on the ſurface all winter. The bad effects above-mentioned take place here in part; and there is another; that rain waſhes the lime down to the furrows, and in a hanging field carries the whole away.

212 Time of liming.

As the particles of powdered lime are both ſmall and heavy, they quickly ſink to the bottom of the furrow, if care be not taken to prevent it. In that view, it is a rule, that lime be ſpread, and mixed with the ſoil, immediately before ſowing, or along with the ſeed. In this manner of application, there being no occaſion to move it till the ground be ſtirred for a new crop, it has time to incorporate with the ſoil, and does not readily ſeparate from it. Thus, if turnip-ſeed is to be ſown broad-caſt, the lime ought to be laid on immediately before ſowing, and harrowed in with the ſeed. If a crop of drilled turnip or cabbage be intended, the lime ought to be ſpread immediately before forming in drills. With reſpect to wheat, the lime ought to be ſpread immediately before ſeed-furrowing. If ſpread more early, before the ground be ſufficiently broken, it ſinks to the bottom. If a light ſoil be prepared for barley, the lime ought to be ſpread after ſeed-furrowing, and harrowed in with the ſeed. In a ſtrong ſoil, it ſinks not ſo readily to the bottom; and therefore, before ſowing the barley, the lime ought to be mixed with the ſoil by a brake. Where moor is ſummer-fallowed for a crop of oats next year, the lime ought to be laid on immediately before the laſt ploughing, and braked in as before. It has ſufficient time to incorporate with the ſoil before the land be ſtirred again.

213 Quantity.

The quantity to be laid on depends on the nature of the ſoil. Upon a ſtrong ſoil, 70 or 80 bolls of ſhells are not more than ſufficient, reckoning four ſmall firlots to the boll, termed *wheat-meaſure*; nor will it be an overdoſe to lay on 100 bolls. Between 50 and 60 may ſuffice upon medium ſoils: and upon the thin or gravelly, between 30 and 40. It is not ſafe to lay a much greater quantity on ſuch ſoils.

214 Liming paſture fields.

It is common to lime in paſture-field immediately before ploughing. This is an unſafe practice; it is thrown to the bottom of the furrow, from which it is never fully gathered up. The proper time for liming a paſture field, intended to be taken up for corn, is a year at leaſt, or two, before ploughing. It is waſhed in by rain among the roots of plants, and has time to incorporate with the ſoil.

215 Beat limeſtone. Limeſtone beat ſmall makes an excellent manure: and ſupplies the want of powdered lime where there is no fuel to burn the limeſtone. Limeſtone beat ſmall has not hitherto been much uſed as a manure; and the proportion between it and powdered lime has not been aſcertained. What follows may give ſome light. Three pounds of raw lime is by burning reduced to two pounds of ſhell-lime. Yet nothing is expelled by the fire but the air that was in the limeſtone: the calcareous earth remains entire. *Ergo*, two pounds of ſhell-lime contain as much calcareous earth as three pounds of raw limeſtone. Shell-lime of the beſt quality, when ſlaked with water, will meaſure out to thrice the quantity. But as limeſtone loſes none of its bulk by being burnt into ſhells, it follows, that three buſhels of raw limeſtone contain as much calcareous earth as ſix buſhels of powdered lime; and, conſequently, if powdered lime poſſeſs not ſome virtue above raw limeſtone, three buſhels of the latter beat ſmall ſhould equal as a manure ſix buſhels of the former.

216 Of ſhell-marle. Shell-marle, as a manure, is managed in every reſpect like powdered lime; with this only difference, that a fifth or a fourth part more in meaſure ought to be given. The reaſon is, that ſhell-marle is leſs weighty than lime; and that a ball of it contains leſs calcareous earth, which is the fructifying part of both.

Clay and ſtone marles, with reſpect to huſbandry, are the ſame, though in appearance different.

217 Of clay and ſtone-marles. The goodneſs of marle depends on the quantity of calcareous earth in it: which has been known to amount to a half or more. It is too expenſive if the quantity be leſs than a third or a fourth part. Good marle is the moſt ſubſtantial of all manures; becauſe it improves the weakeſt ground to equal the beſt borough-acres. The low part of Berwickſhire termed *the Merſe*, abounds every where with this marle; and is the only county in Scotland where it is plenty.

Land ought to be cleared of weeds before marling; and it ought to be ſmoothed with the break and harrow, in order that the marle may be equally ſpread. Marle is a foſſil on which no vegetable will grow; its efficacy depends, like that of lime, on its pulverization, and intimate mixture with the ſoil. Toward the former, alternate drought and moiſture contribute greatly, as alſo froſt. Therefore, after being evenly ſpread, it ought to lie on the ſurface all winter. In the month of October it may be rouſed with a brake; which will bring to the ſurface, and expoſe to the air and froſt, all the hard parts, and mix with the ſoil all that is powdered. In that reſpect it differs widely from dung and lime, which ought to be ploughed into the ground without delay. Oats is a hardy grain, which will anſwer for being the firſt crop after marling better than any other; and it will ſucceed though the marle be not thoroughly mixed with the ſoil. In that caſe, the marle ought to be ploughed in with an ebb furrow immediately before ſowing, and braked thoroughly. It is ticklish to make wheat the firſt crop: if ſown before winter, froſt ſwells the marle, and is apt to throw the ſeed out of the ground; if ſown in ſpring, it will ſuffer more than oats by want of due mixture.

Summer is the proper ſeaſon for marling; becauſe in that ſeaſon the marle, being dry, is not only lighter, but is eaſily reduced to powder. Froſt however is not improper for marling, eſpecially as in froſt there is little opportunity for any other work.

Marle is a heavy body, and ſinks to the bottom of the furrow, if indiſcreetly ploughed. Therefore the firſt crop ſhould always have an ebb furrow. During the growing of that crop, the marle has time to incorporate with the ſoil, and to become a part of it; after which it does not readily ſeparate.

SECT. VIII. *Principles and Operations of the New or horſe-hoeing Huſbandry.*

THE general properties attributed to the new huſbandry may be reduced to two, viz. the promoting the growth of plants by hoeing, and the ſaving of ſeed; both of which are equally profitable to the farmer.

218 Advantages aſcribed to horſe-hoeing. The advantages of tillage before ſowing have already been pointed out. In this place we muſt confine ourſelves to the utility of tillage after ſowing. This kind of tillage is moſt generally known by the name of *horſe-hoeing*.

Land ſowed with wheat, however well it may be cultivated in autumn, ſinks in the winter; the particles get nearer together, and the weeds riſe; ſo that in ſpring, the land is nearly in the ſame ſituation as if it never had been ploughed. This, however, is the ſeaſon when it ſhould branch and grow with moſt vigour; and conſequently ſtands moſt in need of ploughing or hoeing, to deſtroy the weeds, to ſupply the roots with freſh earth, and, by dividing anew the particles of the ſoil, to allow the roots to extend and collect nouriſhment.

It is well known, that, in gardens, plants grow with double vigour after being hoed or tranſplanted. If plants growing in arable land could be managed with eaſe and ſafety in this manner, it is natural to expect, that their growth would be promoted accordingly. Experience ſhows, that this is not only practicable, but attended with many advantages.

In the operation of hoeing wheat, though ſome of the roots be moved or broken, the plants receive no injury; for this very circumſtance makes them ſend forth a greater number of roots than formerly, which enlarge their paſture, and conſequently augment their growth.

Sickly wheat has often recovered its vigour after a good hoeing, eſpecially when performed in weather not very hot or dry.

Wheat, and ſuch grain as is ſown before winter, requires hoeing more than oats, barley, or other grain ſown in the ſpring; for, if the land has been well ploughed before the ſowing of ſpring-corn, it neither has time to harden, nor to produce many weeds, not having been expoſed to the winter's ſnow and rain.

Of SOWING.

219 Method of ſowing in the New-Huſbandry. As, in the practice of the New Huſbandry, plants grow with greater vigour than by the old method, the land ſhould be ſowed thinner. It is this principle of the new huſbandry that has been chiefly objected to; for, upon obſerving the land occupied by a ſmall number of plants, people are apt to look upon all the va-

cant ſpace as loſt. But this prejudice will ſoon be removed, when it is conſidered, that, in the beſt land cultivated in the common method, and ſown very thick, each ſeed produces but one or two ears; that, in the ſame land ſown thinner, every ſeed produces two or three ears; and that a ſingle ſeed ſometimes produces 18 or 21 ears.

In the common method, as there are many more plants than can find ſufficient nouriſhment, and as it is impoſſible to aſſiſt them by hoeing, numbers die before they attain maturity, the greateſt part remain ſickly and drooping; and thus part of the ſeed is loſt. On the contrary, in the new method, all the plants have as much food as they require; and as they are, from time to time, aſſiſted by hoeing, they become ſo vigorous as to equal in their production the numerous but ſickly plants cultivated in the common method.

Of Hoeing.

The new huſbandry is abſolutely impracticable in lands that are not eaſily ploughed. Attempting to cultivate land according to this huſbandry, without attending to this circumſtance, that it is practicable in no lands excepting ſuch as have already been brought into good tilth by the old method, has gone far to make it contemptible in many places.

220 The different hoeings. When a field is in good tilth, it ſhould be ſown ſo thin as to leave ſufficient room for the plants to extend their roots. After being well ploughed and harrowed, it muſt be divided into rows, at the diſtance of thirty inches from one another. On the ſides of each of theſe rows, two rows of wheat muſt be ſowed ſix inches diſtant from each other. By this means there will be an interval of two feet wide betwixt the rows, and every plant will have room enough to extend its roots, and to ſupply it with food. The intervals will likewiſe be ſufficient for allowing the earth to be hoed or tilled without injuring the plants in the rows.

The firſt hoeing, which ſhould be given before the winter, is intended to drain away the wet, and to diſpoſe the earth to be mellowed by the froſts. Theſe two ends will be anſwered by drawing two ſmall furrows at a little diſtance from the rows, and throwing the earth taken from the furrows into the middle of the intervals. This firſt hoeing ſhould be given when the wheat is in leaf.

The ſecond hoeing, which is intended to make the plants branch, ſhould be given after the hard froſts are over. To do this with advantage, after ſtirring the earth a little near the rows, the earth which was thrown in the middle of the intervals ſhould be turned back into the furrows. This earth, having been mellowed by the winter, ſupplies the plants with excellent food, and makes the roots extend.

The third hoeing, which is intended to invigorate the ſtalk, ſhould be given when the ears of the corn begin to ſhow themſelves. This hoeing may, however, be very ſlight.

But the laſt hoeing is of the greateſt importance, as it enlarges the grain, and makes the ears fill at their extremities. This hoeing ſhould be given when the wheat is in bloom; a furrow muſt be drawn in the middle of the interval, and the earth thrown to the right and left on the root of the plants. This ſupports the plants, prevents them from being laid, and prepares the ground for the next ſowing, as the ſeed is then to be put in the middle of the ground that formed the intervals.

The beſt ſeaſon for hoeing is two or three days after rain, or ſo ſoon after rain as the ſoil will quit the inſtrument in hoeing. Light dry ſoils may be hoed almoſt any time, but this is far from being the caſe with ſtrong clay ſoils; the ſeaſon for hoeing ſuch is frequently ſhort and precarious; every opportunity therefore ſhould be carefully watched, and eagerly embraced. The two extremes of wet and dry, are great enemies to vegetation in ſtrong clay ſoils. There is a period between the time of clay ſoils running together, ſo as to puddle by ſuperfluous wet, and the time of their caking by drought, that they are as tractable as need be. This is the juncture for hoeing; and ſo much land as ſhall be thus ſeaſonably hoed, will not cake or cruſt upon the ſurface, as it otherwiſe would have done, till it has been ſoaked or drenched again with rain; in which caſe the hoeing is to be repeated as ſoon as the ſoil will quit the inſtrument, and as often as neceſſary; by which time the growing crop will begin to cover the ground, ſo as to act as a ſcreen to the ſurface of the land againſt the intenſe heat of the ſun, and thereby prevent, in great meaſure, the bad effects of the ſoil's caking in dry weather.

By this ſucceſſive tillage, or hoeing, good crops will be obtained, provided the weather is not very unfavourable.

But as ſtrong, vigorous plants are longer before they arrive at maturity, corn raiſed in the new way is later in ripening than any other, and muſt therefore be ſown earlier.

In order to prepare the intervals for ſowing again, ſome well-rotted dung may be laid in the deep furrows made in the middle of the intervals; and this dung muſt be covered with the earth that was before thrown towards the rows of wheat. But, if the land does not require mending, the deep furrow is filled without any dung. This operation ſhould be performed immediately after harveſt, that there may be time to give the land a ſlight ſtirring before the rows are ſowed; which ſhould occupy the middle of the ſpace which formed the intervals during the laſt crop. The intervals of the ſecond year take up the ſpace occupied by the ſtubble of the firſt.

Suppoſing dung to be neceſſary, which is denied by many, a very ſmall quantity is ſufficient; a ſingle layer, put in the bottom of each furrow, will be enough.

Description of the Instruments commonly uſed in the New Husbandry.

Fig. 1. is a marking plough. The principal uſe of this plough is to ſtraight and regulate the ridges. The firſt line is traced by the eye, by means of three poles, placed in a ſtraight line. The plough draws the firſt furrow in the direction of this line; and, at the ſame time, with the tooth A, fixed in the block of wood near the end of the croſs-pole or ſlider B B, marks the breadth of the ridge at the diſtance intended. The ploughman next traces the ſecond line or rutt made by the tooth, and draws a ſmall furrow along it; and continues in this manner till the whole field is laid out in ſtraight and equidiſtant ridges. 221 Inſtruments deſcribed. Plate VIII.

Plate VIII.

Fig. 2. is a plough for breaking up lea, or turning up the bottom of land when greatly exhauſted. By its conſtruction, the width and depth of the furrows can be regulated to a greater certainty than by any other hitherto known in this country. Its appearance is heavy; but two horſes are ſufficient to plough with it in ordinary free land; and only four are neceſſary in the ſtiffeſt clay-ſoils. This plough is likewiſe eaſily held and tempered. A, is the ſword fixed in the ſizers B, which runs thro' a mortiſe E, at the end of the beam C, and regulates the depth of the furrow by raiſing or depreſſing the beam; it is fixed by putting the pin D thro' the beam and ſword, and is moveable at E.

Fig. 3, is a jointed brake-harrow with 24 teeth, ſhaped like coulters, and ſtanding at about an angle of 80 degrees. By this inſtrument the land is finely pulverized, and prepared for receiving the ſeed from the drill. It requires four horſes in ſtiff, and two in open, land. This harrow is likewiſe uſed for levelling the ridges; which is done by preſſing it down by the handles where the ridge is high, and raiſing it up when low.

Fig. 4. is an angular weeding harrow, which may follow the brake when neceſſary. The ſeven hindmoſt teeth ſhould ſtand at a more acute angle than the reſt, in order to collect the weeds, which the holder can drop at pleaſure, by raiſing the hinder part, which is fixed to the body of the harrow by two joints.

Fig. 5. is a pair of harrows with ſhafts. This harrow is uſed for covering the ſeed in the drills, the horſes going in the furrow.

Fig. 6. is a drill-plough, conſtructed in ſuch a manner as to ſow at once two rows of beans, peaſe, or wheat. This machine is eaſily wrought by two horſes. A, is the happer for containing the ſeed; B, circular boxes for receiving the ſeed from the happer; CC, two ſquare boxes which receive the ſeed from ſmall holes in the circular boxes, as they turn round; and laſt of all, the ſeed is dropped into the drills through holes in the ſquare boxes, behind the coulters D. The cylinder E follows, which, together with the wheel F, regulates the depth of the coulters, and covers the ſeed; the harrow G comes behind all, and covers the ſeed more completely. HH, two ſliders, which, when drawn out, prevent the ſeed from falling into the boxes; and, I, is a catch which holds the rungs, and prevents the boxes from turning, and loſing ſeed at the ends of the ridges.

Fig. 7. is a ſingle hoe-plough of a very ſimple conſtruction, by which the earth in the intervals is ſtirred and laid up on both ſides to the roots of the plants, and at the ſame time the weeds are deſtroyed. A A, the mould-boards, which may be raiſed or depreſſed at pleaſure, according as the farmer wants to throw the earth higher or lower upon the roots.

Plate VII.

Fig. 2. is a drill-rake for peaſe. This inſtrument, which is chiefly calculated for ſmall incloſures of light grounds, is a ſort of ſtrong plough rake, with four large teeth, at *a*, *a*, *b*, *b*, a little incurvated. The diſtance from *a* to *a*, and from *b* to *b*, is nine inches. The interval between the two inner teeth, *a* and *b*, is three feet ſix inches, which allows ſufficient room for the hole-plough to move in. To the piece of timber *cc*, forming the head of the rake, are fixed the handles *d*, and the beam *e*, to which the horſe is faſtened. When this inſtrument is drawn over a piece of land made thoroughly fine, and the man who holds it bears upon the handles, four furrows, *f*, *g*, *h*, *i*, will be formed, at the diſtances determined by the conſtruction of the inſtrument These diſtances may be accurately preſerved, provided that the teeth *aa* return when the ploughman comes back, after having ploughed one turn, in two of the channels formed before, marked *b b*: thus all the furrows in the field will be traced with the ſame regularity. When the ground is thus formed into drills, the peaſe may be ſcattered by a ſingle motion of the hand at a certain diſtance from one another into the channels, and then covered with the flat part of a hand-rake, and preſſed down gently. This inſtrument is ſo ſimple, that any workman may eaſily make or repair it.

On Plate IX. is delineated a patent drill machine, lately invented by the Reverend James Cooke of Heaton-Norris near Mancheſter. A, the upper part of the ſeed-box. B, the lower part of the ſame box. C, a moveable partition, with a lever, by which the grain or ſeed is let fall at pleaſure from the upper to the lower part of the ſeed-box, from whence it is taken up by cups or ladles applied to the cylinder D, and dropped into the funnel E, and conveyed thereby into the furrow or drill made in the land by the coulter F, and covered by the rake or harrow G. H, a lever, by which the wheel I is lifted out of generation with the wheel K, to prevent the grain or ſeed being ſcattered upon the ground, while the machine is turning round at the end of the land, by which the harrow G is alſo lifted from the ground at the ſame time, and by the ſame motion, by means of the crank, and the horizontal lever *h h*. L, a ſliding lever, with a weight upon it, by means of which, the depth of the furrows or drills, and conſequently the depth that the grain or ſeed will be depoſited in the land, may be eaſily aſcertained. M, a ſcrew in the coulter beam, by turning of which, the ſeed-box B is elevated or depreſſed, in order to prevent the grain or ſeed being cruſhed or bruiſed by the revolution of the cups or ladles. Fig. 13. a rake with iron teeth, to be applied to the under ſide of the rails of the machine, with ſtaples and ſcrew nuts at *n n*, by which many uſeful purpoſes are anſwered, viz. in accumulating cuitch or hay into rows, and as a ſcarificator for young crops of wheat in the ſpring, or to be uſed upon a fallow; in which caſe, the ſeed-box, the ladle cylinder, the coulters, the funnels, and harrows, are all taken away.

This ſide view of the machine is repreſented, for the ſake of perſpicuity, with one ſeed-box only, one coulter, one funnel, one harrow, &c. whereas a complete machine is furniſhed with five coulters, five harrows, ſeven funnels, a ſeed-box in eight partitions, &c. with ladles of different ſizes, for different ſorts of grain and ſeeds.

Theſe machines, (with five coulters ſixteen guineas, with four coulters fifteen guineas) equally excel in ſetting or planting all ſorts of grain and ſeeds, even carrot ſeed, to exactneſs, after the rate of from eight to ten chain acres per day, with one man, a boy, and two horſes. They depoſite the grain or ſeed in any given quantity from one peck to three buſhels per acre, regularly and uniformly, and that without grinding or bruiſing the ſeed, and at any given depth, from half an inch to half a dozen inches, in rows at the diſtance of twelve, ſixteen, and twenty-four inches, or any other diſtance. They are equally uſeful on all lands, are durable, eaſy to manage, and by no means ſubject to be put out of repair.

The ladle cylinder D is furniſhed with cups or ladles of four different ſizes for different ſorts of grain or ſeeds, which may be diſtinguiſhed by the numbers 1, 2, 3, 4.—N° 1. (the ſmalleſt ſize) is calculated for turnip-ſeed, clover-ſeed, cole-ſeed, rape, &c. and will ſow ſomething more than one pound per ſtatute acre. N° 2. for wheat, rye, hemp, flax, &c. and will ſow ſomething more than one buſhel per acre. N° 3. for barley; and will ſow one buſhel and a half per acre. N° 4. for beans, oats, peaſe, vetches, &c. and will ſow two buſhels per acre.

Notwithſtanding the above ſpecified quantities of grain or ſeeds, a greater or leſs quantity of each may be ſown at pleaſure, by ſtopping up with a little clay, or by adding a few ladles to each reſpective box. The grain or ſeeds intended to be ſown, muſt be put in thoſe boxes, to which the cups or ladles as above deſcribed reſpectively belong, an equal quantity into each box, and all the other boxes empty. The ladle cylinder may be reverſed, or turned end for end at pleaſure, for different ſorts of grain, &c.

For ſowing beans, oats, peaſe, &c. with a five-coulter machine, four large ladles muſt occaſionally be applied at equal diſtances round thoſe parts of the cylinder which ſubtend the two end boxes. And for ſowing barley, eight large ones muſt be applied as above; or four ladles, N° 2. to each of the wheat boxes. Theſe additional ladles are fixed on the cylinder with nails, or taken off in a few minutes; but for ſowing with a four-coulter machine, the above alterations are not neceſſary.

The funnels are applied to their reſpective places by correſponding numbers. Care ſhould be taken, that the points of the funnel ſtand directly behind the backs of the coulters, which is done by wedges being applied to one ſide or other of the coulters, at the time they are fixed in their reſpective places.

The machine being thus put together, which is readily and expeditiouſly done, as no ſeparate part will coincide with any other but that to which it reſpectively belongs, and an equal quantity of grain or ſeed in each of the reſpective boxes, the land alſo being previouſly ploughed and harrowed once or ſo in a place to level the ſurface; but if the land be very rough, a roller will beſt anſwer that purpoſe, whenever the land is dry enough to admit of it; and upon ſtrong clays, a ſpiked roller is ſometimes neceſſary to reduce the ſize of large dry clods; which being done, the driver ſhould walk down the furrow or edge of the land, and having hold of the laſt horſe's head with his hand, he will readily keep him in ſuch a direction, as will bring the outſide coulter of the machine within three or four inches of the edges of the land or ridge, at which uniform extent, he ſhould keep his arm till he comes to the end of the land; where having turned round, he muſt come to the other ſide of his horſes, and walking upon the laſt outſide drill, having hold of the horſe's head with his hand as before, he will readily keep the machine in ſuch a direction, as will ſtrike the ſucceeding drill at ſuch a diſtance from the laſt outſide one, or that he walks upon, as the coulters are diſtant from each other.

The perſon who attends the machine ſhould put down the lever H ſoon enough at the end of the land, that the cups or ladles may have time to fill, before he begins to ſow; and at the end of the land, he muſt apply his right hand to the middle of the rail between the handles, by which he will keep the coulters in the ground, while he is lifting up the lever H with his left hand, to prevent the grain being ſcattered upon the headland, while the machine is turning round; this he will do with great eaſe, by continuing his right hand upon the rail between the handles, and applying his left arm under the left handle, in order to lift the coulters out of the ground while the machine is turning round.

If there be any difficulty in uſing the machine, it conſiſts in driving it ſtraight. As to the perſon who attends the machine, he cannot poſſibly commit any errors, except ſuch as are wilful, particularly as he ſees at one view the whole proceſs of the buſineſs, viz. that the coulters make the drills of a proper depth; that the funnels continue open to convey the grain or ſeed into the drills; that the rakes or harrows cover the grain ſufficiently; and when ſeed is wanting in the lower boxes B, which he cannot avoid ſeeing, he readily ſupplies them from the upper boxes A, by applying his hand, as the machine goes along, to the lever C. The lower boxes B, ſhould not be ſuffered to become empty before they are ſupplied with ſeed, but ſhould be kept nearly full, or within an inch or ſo of the edge of the box.

If chalk lines are made acroſs the backs of the coulters, at ſuch a diſtance from the ends as the ſeed ſhould be depoſited in the ground (viz. about two inches for wheat, and from two to three for ſpring corn), the perſon that attends the machine will be better able to aſcertain the depth the ſeed ſhould be depoſited in the drills, by obſerving, as the machine goes along, whether the chalk lines are above or below the ſurface of the land; if above, a proper weight muſt be applied to the lever L, which will force the coulters into the ground; if below, the lever L and weight muſt be reverſed, which will prevent their ſinking too deep.

In different parts of the kingdom, lands or ridges are of different ſizes; where the machine is too wide for the land, one or more funnels may occaſionally be ſtopped with a little looſe paper, and the ſeed received into ſuch funnel returned at the end of the land, or ſooner if required, into the upper ſeed-box. But for regularity and expedition, lands conſiſting of ſo many feet wide from outſide to outſide, as the machine contains coulters, when fixed at twelve inches diſtance, or twice or three times the number, &c. are beſt calculated for the machine. In wet ſoils or ſtrong clays, lands or ridges of the width of the machine, and in dry ſoils, of twice the width, are recommended. For ſowing of narrow high-ridged lands, the outſide coulters ſhould be let down, and the middle ones raiſed, ſo that the points of the coulters may form the ſame curve that the land or ridge forms. And the looſe ſoil harrowed down into the furrows ſhould be returned to the edges of the lands or ridges from whence it came, by a double mould-board or other plough, whether the land be wet or dry.

Clover or other hays, intended to be ſown by the machine, ſhould be ploughed a deep ſtrong furrow and well harrowed, in order to level the ſurface, and get as much looſe ſoil as poſſible for the coulters to work in; and when ſown, if any of the ſeed appears in the drills uncovered by reaſon of the ſtiff texture of the ſoil, or toughneſs of the roots, a light harrow may be taken over the land, once in a place, which will effectually cover the ſeed, without diſplacing it at all in the drills. For ſowing leas, a conſiderable weight muſt be applied to the lever L, to force the coulters into the ground; and a ſet of wrought-iron coulters, well-ſteeled, and made ſharp at the front edge and bottom, are recommended; they will pervade the ſoil more readily, conſequently require leſs draught, and expedite buſineſs more than adequate to the additional expence.

For every half acre of land intended to be ſown by the machine with the ſeed of that very valuable root, (carrot) one buſhel of ſaw-duſt, and one pound of carrot ſeed, ſhould be provided; the ſaw-duſt ſhould be made dry, and ſifted to take out all the lumps and chips, and divided into eight equal parts or heaps; the carrot ſeed ſhould likewiſe be dried, and well rubbed between the hands, to take off the beards, ſo that it will ſeparate readily, and being divided into eight equal parts or heaps, one part of the carrot ſeed muſt be well mixed with one part of the ſaw-duſt, and ſo on, till all the parts of the carrot ſeed and ſaw-duſt are well mixed and incorporated together; in which ſtate it may be ſown very regularly in drills at twelve inches diſtance, by the cups or ladles N° 2. Carrot ſeed reſembling ſaw-duſt very much in its ſize, roughneſs, weight, adheſion, &c. will remain mixed as above during the ſowing; a ladle-full of ſaw-duſt will, upon an average, contain three or four carrot ſeeds, by which means the carrot ſeed cannot be otherwiſe than regular in the drills. In attempting to depoſit ſmall ſeeds near the ſurface, it may ſo happen that ſome of the ſeeds may not be covered with ſoil; in which caſe, a light roller may be drawn over the land after the ſeed is ſown, which will not only cover the ſeeds, but will alſo, by levelling the ſurface, prepare the land for an earlier hoeing than could otherwiſe have taken place.

It has always been found troubleſome, ſometimes impracticable, to ſow any kind of grain or ſeeds (even broad-caſt) in a high wind. This inconvenience is entirely obviated, by placing a ſcreen of any kind of cloth, or a ſack, ſupported by two uprights nailed to the ſides of the machine, behind the funnels, which will prevent the grain or ſeed being blown out of its direction in falling from the ladles into the funnels. Small pipes of tin may alſo be put on the ends of the funnels, to convey the grain or ſeed ſo near the ſurface of the land, that the higheſt wind ſhall not be able to interrupt its deſcent into the drills.

Reſpecting the uſe of the machine, it is frequently remarked by ſome people not converſant with the properties of matter and motion, that the ſoil will cloſe after the coulters before the ſeed is admitted into the drills. Whereas the very contrary is the caſe; for the velocity of the coulters in paſſing through the ſoil, is ſo much greater than the velocity with which the ſoil cloſes up the drills by its own ſpontaneous gravity, that the inciſions or drills will be conſtantly open for three or four inches behind the coulters; by which means, it is morally impoſſible (if the points of the funnels ſtand directly behind the coulters) that the ſeed with the velocity it acquires in falling through the funnels, ſhall not be admitted into the drills.

Plate IX. Fig. 12. is a new conſtructed ſimple hand-hoe, by which one man will effectually hoe two chain acres per day, earthing up the ſoil at the ſame time to the rows of corn or pulſe, ſo as to cauſe roots to iſſue from the firſt joint of the ſtem, above the ſurface of the land, which otherwiſe would never have exiſted.

This hoe is worked much in the ſame manner as a common Dutch hoe, or ſcuffle, is worked in gardens. The handle is elevated or depreſſed, to ſuit the ſize of the perſon that works it, by means of an iron wedge being reſpectively applied to the upper or under ſide of the handle that goes into the ſocket of the hoe.

The wings or moulding plates of the hoe, which are calculated to earth up the ſoil to the rows of corn, ſo as to cauſe roots to iſſue from the firſt joint of the ſtem above the ſurface, which otherwiſe would not have exiſted, ſhould never be uſed for the firſt hoeing, but ſhould always be uſed for the laſt hoeing, and uſed or not uſed, at the option of the farmer, when any intermediate hoeing is performed.

Summary of the Operations neceſſary in executing the New Husbandry with the Plough.

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Summary of the operations.

1. It is indiſpenſibly neceſſary that the farmer be provided with a drill and hoe-plough.

2. The new huſbandry may be begun either with the winter or ſpring corn.

3. The land muſt be prepared by four good ploughings, given at different times, from the beginning of April to the middle of September.

4. Theſe ploughings muſt be done in dry weather, to prevent the earth from kneading.

5. The land muſt be harrowed in the ſame manner as if it were ſowed in the common way.

6. The rows of wheat ſhould be ſowed very ſtraight.

7. When the field is not very large, a line muſt be ſtrained acroſs it, by which a rill may be traced with a hoe for the horſe that draws the drill to go in; and when the rows are ſown, 50 inches muſt be left betwixt each rill. But when the field is large, ſtakes at five feet diſtance from each other muſt be placed at the two ends. The workmen muſt then trace a ſmall furrow with a plough that has no mould-board, for the horſe to go in that draws the drill, directing himſelf with his eye by the ſtakes.

8. The ſowing ſhould be finiſhed at the end of September, or beginning of October.

9. The furrows muſt be traced the long way of the land, that as little ground as poſſible may be loſt in headlands.

10. The rows, if it can be done, ſhould run down the ſlope of the land, that the water may get the eaſier off.

11. The ſeed-wheat muſt be plunged into a tub of lime-water, and ſtirred, that the light corn may come to the ſurface and be ſkimmed off.

12. The ſeed muſt be next ſpread on a floor, and frequently ſtirred, till it is dry enough to run through the valves of the happer of the drill.

13. To prevent ſmut, the ſeed may be put into a ley of aſhes and lime.

AGRICULTURE

Plate VIII

Fig 2

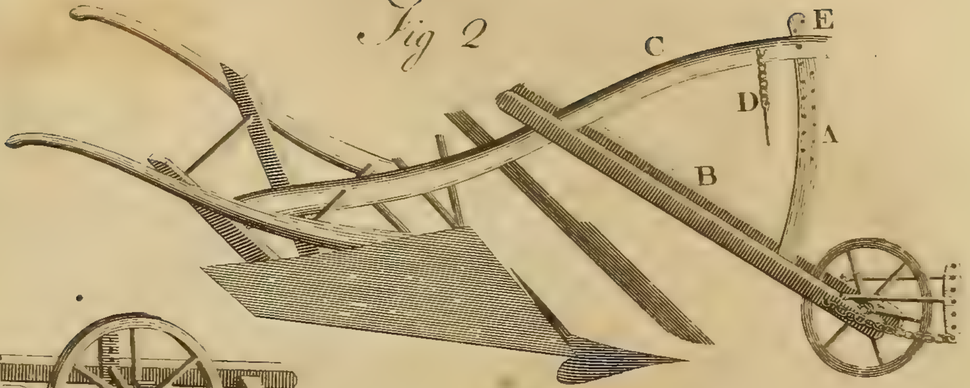


Fig 1

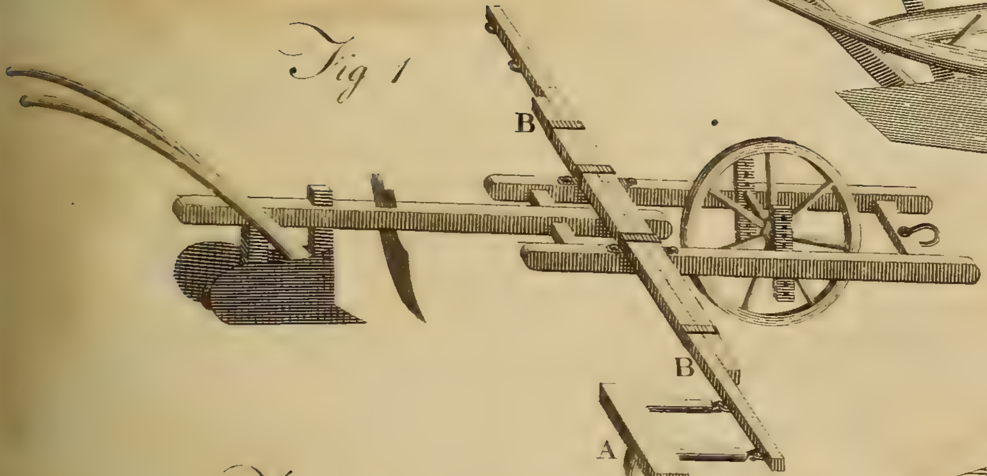


Fig 4

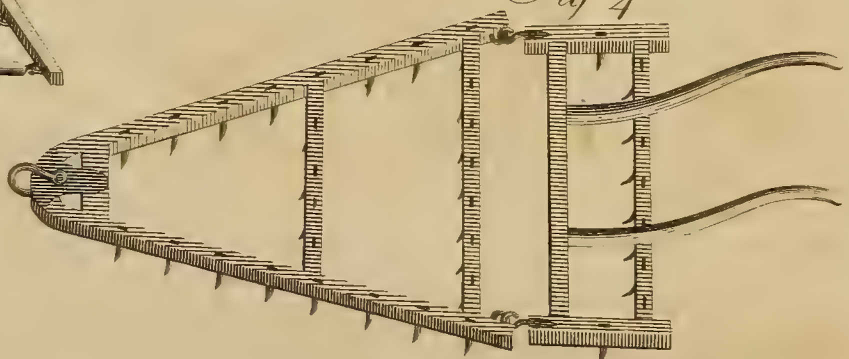


Fig 3

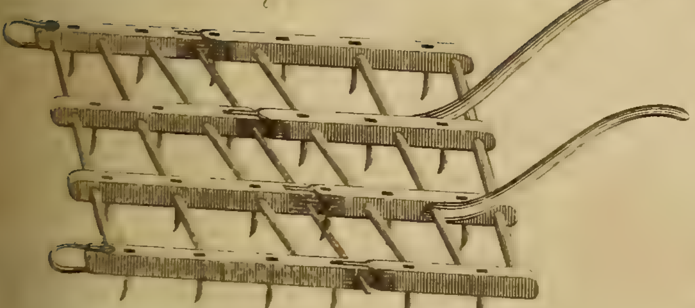


Fig 5

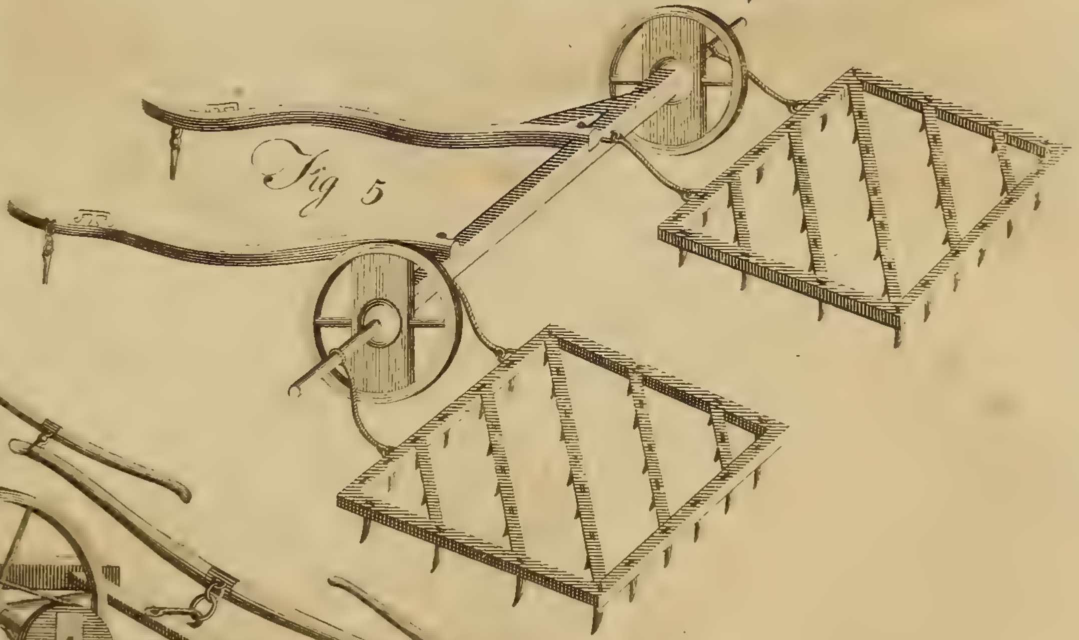


Fig 6

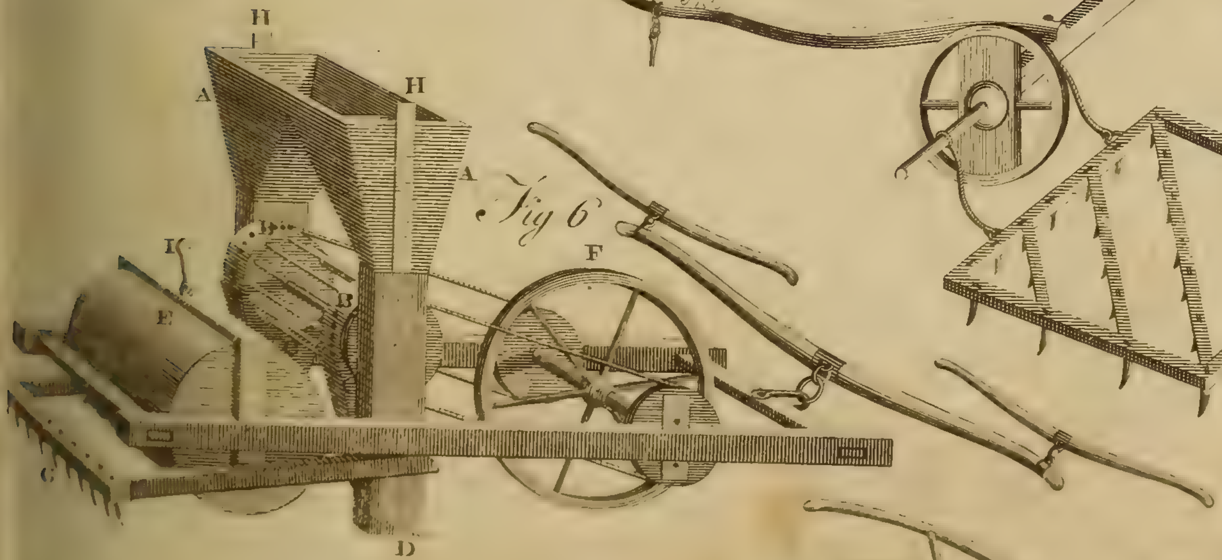
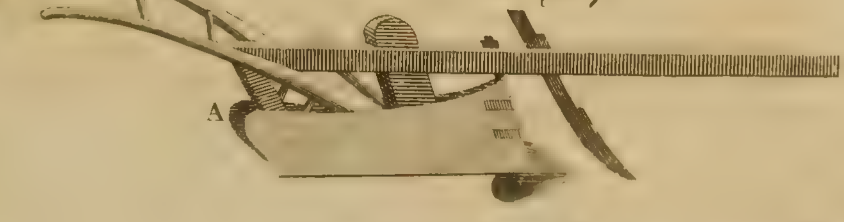


Fig 7



R. Scot Sculp. Phil.

AGRICULTURE Plate IX

The Universal Sowing Machine

Fig 1

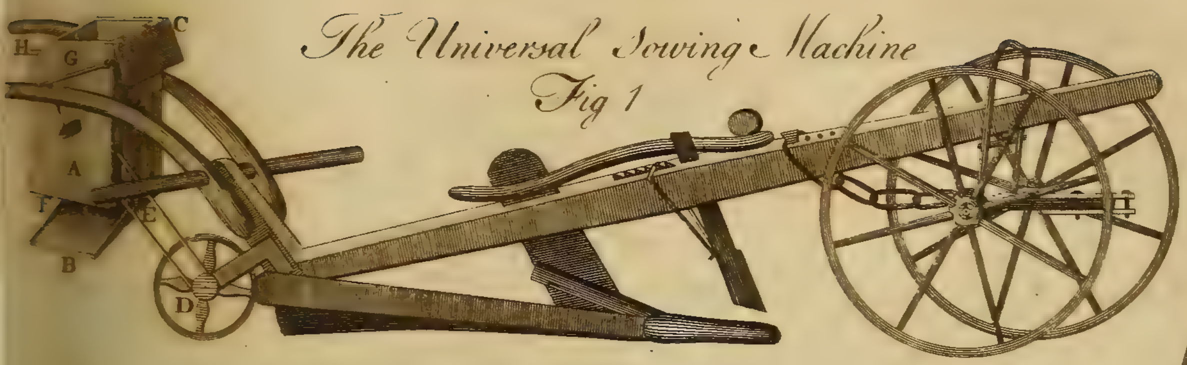


Fig 8

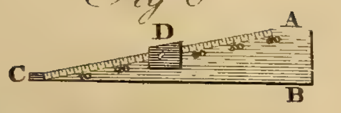


Fig 3

Fig 2

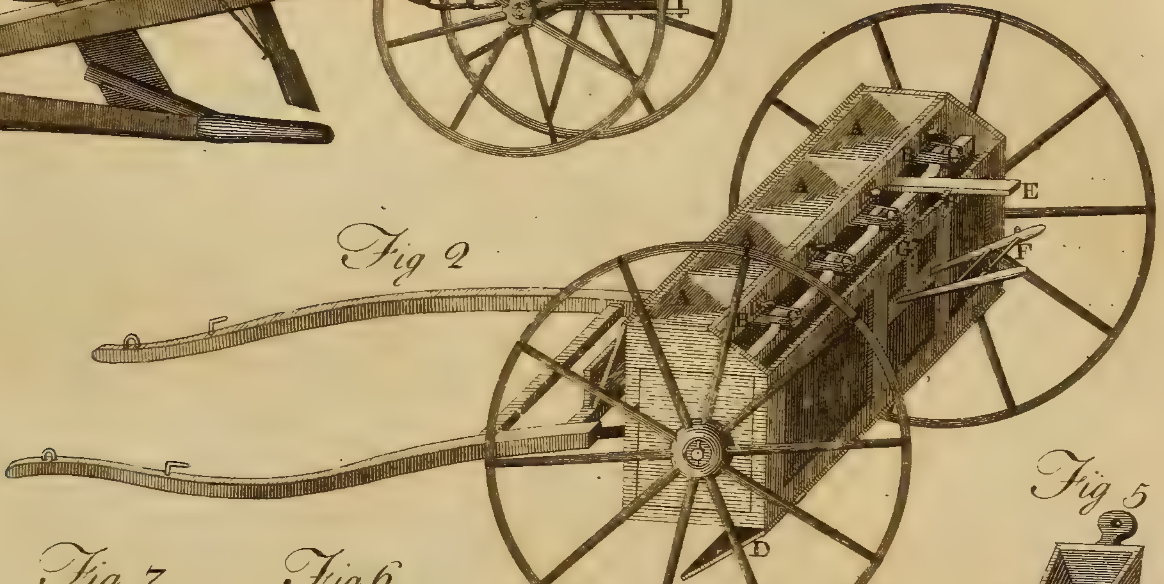


Fig 10

Fig 7

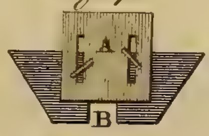


Fig 6

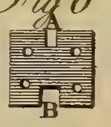


Fig 5

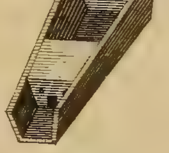


Fig 4

Fig 11

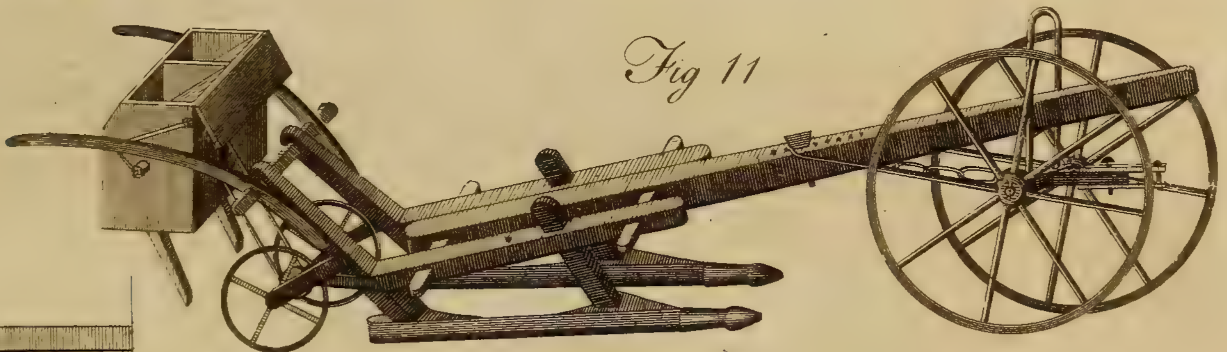
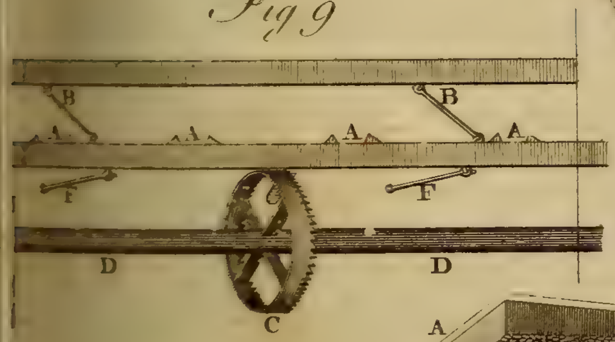


Fig 9



Cook's Drill Machine

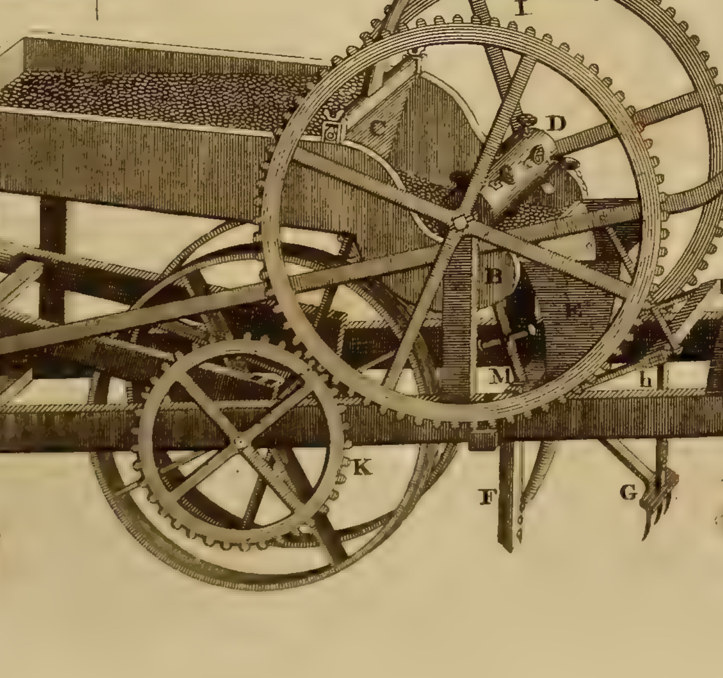


Fig 12

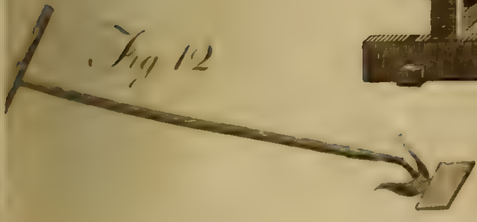


Fig 13

R. Scot Sculp. Philad.

14. Good old ſeed-wheat ſhould be choſen in preference to new, as it is found by experience not to be ſo ſubject to ſmut.

15. After the happers of the drill are filled, the horſe muſt go ſlowly along the furrow that was traced. That a proper quantity of ſeed may be ſown, the aperture of the happer muſt be ſuited to the ſize of the grain.

16. As the drill is ſeldom well managed at firſt, the field ſhould be examined after the corn has come up, and the deficiencies ſupplied.

17. Upon wet ſoils or ſtrong clays, wheat ſhould not be depoſited more than two inches deep, on any account whatever; nor leſs than two inches deep on dry ſoils. From two or three inches is a medium depth for all ſpring corn. But the exact depth at which grain ſhould be depoſited in different ſoils, from the lighteſt ſand to the ſtrongeſt clay, is readily aſcertained only by obſerving at what diſtance under the ſurface of the land, the ſecondary or coronal roots are formed in the ſpring.

18. Stiff lands, that retain the wet, muſt be ſtirred or hoed in October. This ſhould be done by opening a furrow in the middle of the intervals, and afterwards filling it up by a furrow drawn on each ſide, which will raiſe the earth in the middle of the intervals, and leave two ſmall furrows next the rows, for draining off the water, which is very hurtful to wheat in winter.

19. The next ſtirring muſt be given about the end of March, with a light plough. In this ſtirring the furrows made to drain the rows muſt be filled up by earth from the middle of the intervals.

20. Some time in May, the rows muſt be evened; which, though troubleſome at firſt, ſoon becomes eaſy, as the weeds are ſoon kept under by tillage.

21. In June, juſt before the wheat is in bloom, another ſtirring muſt be given with the plough. A deep furrow muſt be made in the middle of the intervals, and the earth thrown upon the ſides of the rows.

22. When the wheat is ripe, particular care muſt be taken, in reaping it, to trample as little as poſſible on the ploughed land.

23. Soon after the wheat is carried off the field, the intervals muſt be turned up with the plough, to prepare them for the ſeed. The great furrow in the middle muſt not only be filled, but the earth raiſed as much as poſſible in the middle of the intervals.

24. In September, the land muſt be again ſowed with a drill as above directed.

25. In October, the ſtubble muſt be turned in for forming the new intervals; and the ſame management muſt be obſerved as directed in the firſt year.

We pretend not to determine whether the old or new huſbandry be preferable in every country. With regard to this point, the climate, the ſituation of particular land, ſkill and dexterity in managing the machinery; the comparative expence in raiſing crops, and many other circumſtances, muſt be accurately attended to before a determination can be given.

The following comparative view of the old and new methods of culture, was furniſhed for the editors of Mr Tull's Horſe-hoeing Huſbandry, by a gentleman who for ſome years practiſed both in a country where the ſoil was light and chalky, like that from which he drew his obſervations. It is neceſſary to remark, that in the new huſbandry every article is ſtated at its full value, and the crop of each year is four buſhels ſhort of the other; though, in ſeveral years experience, it has equalled and generally exceeded thoſe of the neighbourhood in the old way.

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Comparative view of the expence and profits of the Old and New Huſbandry

“ An eſtimate of the expence and profit of 10 acres of land in 20 years.

I. In the old way.

	£.	s.	d.	£.	s.	d.
Firſt year, for wheat, coſts 33l. 5s. viz.						
Firſt ploughing, at 6s. per acre	3	0	0			
Second and third ditto, at 8s. per acre -	4	0	0			
Manure, 30s. per acre -	15	0	0	22	0	0
Two harrowings, and ſowing, at 2s. 6d. per acre -	1	5	0			
Seed, three buſhels per acre, at 4s. per buſhel -	6	0	0			
Weeding, at 2s. per acre -	1	0	0			
Reaping, binding, and carrying, at 6s. per acre -	3	0	0	11	5	0
Second year, for barley, coſts 11l. 6s. 8d. viz.						
Once ploughing, at 6s. per acre - -	3	0	0			
Harrowing and ſowing, at 1s. 6d. per acre -	0	15	0			
Weeding, at 1s. per acre -	0	10	0			
Seed, four buſhels per acre, at 2s per buſhel -	4	0	0			
Cutting, raking, and carrying, at 3s. 2d. per acre -	1	11	8			
Graſs-ſeeds, at 3s. per acre	1	10	0	11	6	8
				44	11	8
Third and fourth years, lying in graſs, coſt nothing: ſo that the expence of ten acres in four years comes to 44l. 11s. 8d. and in twenty years to -				222	18	4
Firſt year's produce is half a load of wheat per acre, at 7l.	35	0	0			
Second year's produce is two quarters of barley per acre, at 1l. - -	20	0	0			
Third and fourth year's graſs is valued at 1l. 10s. per acre	15	0	0			
So that the produce of ten acres in four years is	70	0	0			
And in twenty years it will be				350	0	0
Deduct the expence, and there remains clear profit on ten acres in twenty years by the old way - -				127	1	8

II. In the new way.

First year's extraordinary expence is, for ploughing and manuring the land, the ſame as in the old way L.22 0 0

Practice.

	£.	s.	d.	£.	s.	d.
Ploughing once more, at 4s. per acre -	2	0	0			
Seed, nine gallons per acre, at 4s. per buſhel -	2	5	0			
Drilling, at 7d. per acre -	0	5	10			
Hand-hoeing, and weeding, at 2s. 6d. per acre -	1	5	0			
Horſe-hoeing ſix times, at 10s. per acre -	5	0	0			
Reaping, binding, and carrying, at 6s. per acre -	3	0	0			
The ſtanding annual charge on ten acres is -	13	15	10			
Therefore the expence on ten acres in twenty years is - -				275	16	8
Add the extraordinaries of the firſt year, and the ſum is - -				297	16	8
The yearly produce is at leaſt two quarters of wheat per acre, at 1l. 8s. per quarter; which, on ten acres in twenty years, amounts to -				560	0	0
Therefore, all things paid there remains clear profit on ten acres in twenty years by the new way - -				262	3	4

224 Arguments in favour of the New Method.

"So that the profit on ten acres of land in twenty years, in the new way, exceeds that in the old by L.135 : 1 : 8, and conſequently is conſiderably more than double thereof; an ample encouragement to practiſe a ſcheme, whereby ſo great advantage will ariſe from ſo ſmall a quantity of land, in the compaſs of a twenty-one years leaſe; one year being allowed, both in the old and new way, for preparing the ground.

"It ought withal to be obſerved, that Mr Tull's huſbandry requires no manure all, though we have here, to prevent objections, allowed the charge thereof for the firſt year; and moreover, that though the crop of wheat from the drill-plough is here put only at two quarters on an acre, yet Mr Tull himſelf, by actual experiment and meaſure, found the produce of his drilled wheat-crop amounted to almoſt four quarters on an acre."

It appears alſo from a comparative calculation of expence and profit between the drill and common huſbandry, taken from Mr Baker's report to the Dublin Society of his experiments in agriculture for the year 1765, that there is a clear profit ariſing upon an Iriſh acre of land in 15 years in the drill huſbandry of L.52 : 3 : 11, and in the common huſbandry of L.27 : 19 : 2; and therefore a greater profit in the drilled acre in this time of L.24 : 4 : 9, which amounts to L.1 : 12 : 3¾ per annum. From hence he infers, that in every 15 years the fee-ſimple of all the tillage-lands of the kingdom is loſt to the community by the common courſe of tillage. In ſtating the accounts, from which their reſult is obtained, no notice is taken of fences, water-cutting the land, weeding and reaping, becauſe theſe articles depend on a variety of circumſtances, and will, in general, exceed in the common huſbandry thoſe incurred by the other.

Beſides, the certainty of a crop is greater in this new way than in the old way of ſowing; for moſt of the accidents attending wheat crops, are owing to their being late ſown, which is neceſſary to the farmer in the old way; but in the horſe-hoeing method the farmer may plough two furrows whereon the next crop is to ſtand immediately after the firſt crop is off. In this manner of huſbandry, the land may be ploughed dry and drilled wet, without any inconvenience; and the ſeed is never planted under the furrow, but placed juſt at the depth which is moſt proper, that is, at about two inches; in which caſe it is eaſy to preſerve it, and there is no danger of burying it. Thus the ſeed has all the advantage of early ſowing, and none of the diſadvantages that may attend it in the other way, and the crop is much more certain than by any other means that can be uſed.

The condition in which the land is left after the crop, is no leſs in favour of the horſe-hoeing huſbandry than all the other articles. The number of plants is the great principle of the exhauſting of land. In the common huſbandry, the number is vaſtly greater than in the drilling way, and three plants in four often come to nothing, after having exhauſted the ground as much as profitable plants; and the weeds which live to the time of harveſt in the common way, exhauſt the land no leſs than ſo many plants of corn, often much more. The horſe-hoeing method deſtroys all the weeds in the far greater part of the land, and leaves that part unexhauſted and perfectly freſh for another crop. The wheat plants being alſo but a third part of the number at the utmoſt of thoſe in the ſowing way, the land is ſo much the leſs exhauſted by them; and it is very evident from the whole, that it muſt be, as experience proves that it is, left in a much better condition after this than after the common huſbandry.

225 Objections and anſwers.

The farmers who are againſt this method object, that it makes the plants too ſtrong, and that they are more liable to the blacks or blights of inſects for that reaſon; but as this allows that the hoeing can, without the uſe of dung, give too much nouriſhment, it is very plain that it can give enough; and it is the farmer's fault if he do not proportion his pains ſo as to have the advantage of the nouriſhment without the diſadvantages. It is alſo objected, that as hoeing can make poor land rich enough to bear good crops of wheat, it may make good land too rich for it. But if this ſhould happen, the ſowing of wheat on it may be let alone a while, and in the place of it the farmer may have a crop of turnips, carrots, cabbages, and the like, which are excellent food for cattle, and cannot be over-nouriſhed: or, if this is not choſen, the land, when thus made too rich, may ſoon be ſufficiently impoveriſhed by ſowing corn upon it in the common old way.

The method of horſe-hoeing huſbandry, ſo ſtrongly recommended by Mr Tull, is objected to by many on account of the largeneſs of the intervals which are to be left behind the rows of corn. Theſe are required to be about five feet wide; and it is thought that ſuch wide ſpaces are ſo much loſt earth, and that the crop is to be ſo much the leſs for it. But it is to be obſerved, that the rows of corn ſeparated by theſe intervals need not be ſingle; they may be double, triple, or quadruple, at the pleaſure of the farmer; and four rows thus ſtanding as one, will have the five foot interval but one-fourth of its bigneſs as to the whole quantity, and it will be but as fifteen inch intervals to plants in ſingle rows. Corn that is ſown irregularly in the common way, ſeems indeed to cover the ground better than that in rows: but this is a mere *deceptio viſus;* for the ſtalks of corn are never ſo thick as when they come out of one plant, or as when they ſtand in a row; and a horſe-hoed plant of corn will have 20 or 30 ſtalks in a piece of ground of the ſame quantity, where an unhoed plant will have only two or three ſtalks. If theſe ſtalks of the hoed plant were ſeparated and planted over the intervals, the whole land would be better covered than it is in the common way; and the truth is, that though theſe hoed fields ſeem to contain a much leſs crop than the common ſown fields, yet they in reality do contain a much greater. It is only the different placing that makes the ſown crops ſeem the larger, and even this is only while both crops are young.

The intervals are not loſt ground, as is uſually ſuppoſed, but when well horſe-hoed they are all employed in the nouriſhment of the crop; the roots of the plants in the adjoining rows ſpreading themſelves thro' the whole interval, and drawing ſuch nouriſhment from it, that they increaſe accordingly. When the plants ſtand in the ſcattered way, as in common ſowing, they are too cloſe to one another; each robs its neighbours of part of their nouriſhment, and conſequently the earth is ſoon exhauſted, and all the plants half ſtarved. The cloſe ſtanding of them alſo prevents the benefit of after-tilling, as the hoe cannot be brought in, nor the ground by any means ſtirred between them to give it a new breaking, and conſequently afford them new food.

Experiments have abundantly proved, that in large grounds of wheat where the different methods have been tried, thoſe parts where the intervals were largeſt have produced the greateſt crops, and thoſe where hoeing was uſed without dung have been much richer than thoſe where dung was uſed without hoeing. If it were poſſible that plants could ſtand as thick, and thrive as well over the whole ſurface of the ground, as they do in the rows ſeparated by theſe large intervals, the crops of corn ſo produced would be vaſtly greater than any that have been heard of; but the truth is, that plants receive their growth not according to the ground they ſtand on, but to the ground they can extend their roots into; and therefore a ſingle row may contain more plants than a large interval can nouriſh, and therefore the ſame number that ſtand in that row, and no more than theſe, could be nouriſhed, if ſcattered over the whole interval; and they would be much worſe nouriſhed in that way; becauſe while the interval is void, the earth may be ſtirred about them, and new roots will be formed in great numbers from every one broken by the inſtruments, and new nouriſhment laid before theſe roots by the breaking the particles of earth, by which the plants will have ſupplies that they cannot have when ſcattered over the whole ſurface, becauſe the ground is then all occupied, and cannot be moved between the plants.

226
In what circumſtance the new method is leſs proper.

All ſoils and all ſituations are not equally proper for this method of planting in rows, with large intervals and hoeing between. The lighteſt ſoils ſeem to be beſt for it, and the tough and wet clays the worſt. Such grounds as lie on the ſides of hills are alſo leſs proper than others for this work.

This method is not ſo proper in common fields, but that not in reſpect of the ſoil, but of the huſbandry of the owners, who are uſually in the old way, and change the ſpecies of corn, and make it neceſſary to fallow every ſecond, third or fourth year. Nevertheleſs it has been found by late experiments, that the intervals betwixt the rows of plants, as recommended by Mr Tull, were too great, perhaps double of what they ſhould be in the moſt profitable method of culture; by which means much leſs crops are obtained than might be produced at nearly the ſame expence. This has rendered the profits of the drill method much leſs than they would have been in a more judicious practice, and, conſequently, has proved a great diſadvantage to it in compariſon with the broad-caſt. Mr Tull was led into this, partly from the want of more perfect inſtruments for hoeing, and of ploughs proper for drilling.

To the preceding ſtatements, the following obſervations by Sir John Anſtruther, publiſhed among the Select Papers of the Bath Society, may not be improperly ſubjoined.

227
Obſervations by Sir John Anſtruther.

The ſlow progreſs which the drill-huſbandry has made in many parts of Great Britain ſince Mr. Tull's time, he obſerves, has been principally owing to the want of proper drill-ploughs. Before drilling can become general, theſe ploughs muſt be ſimple, ſuch as a common ploughman accuſtomed to uſe ſtrong inſtruments can uſe without breaking, and ſuch alſo as common workmen can eaſily make or repair. Mathematical accuracy he conſiders as not required for delivering the ſeed; for it matters very little whether there be a quarter of a peck more or leſs ſown, if it be delivered with tolerable regularity. He therefore had a plough made, according to his own directions, by a common plough-wright, of ſufficient ſtrength for any land made fit for turnips or wheat. It was tried on very rough ground unfit for ſowing, in order to aſcertain its ſtrength; and it had been uſed for eight years without its needing any repair. It is a double drill-plough, which ſows two ridges at a time, the horſe going in the furrow between them, and of courſe does not tread upon the ground intended to be ſown; which with a ſingle drill muſt be the caſe, and does much harm by the horſes feet ſinking and making holes in the fine ground, which retain the water, and hurt the wheat when young.

He proceeds to obſerve, "That having read Mr Forbes upon the extenſive practice of the new huſbandry, and ſome other authors, who gave a more clear and diſtinct account of the different operations in drilling than had heretofore been given, I wiſhed to try them, and to adapt my plough to ſow the quantities therein directed. It was, however, adjuſted to ſow a ſmaller quantity, and the ſeed was not ſteeped.

"Not having ground ſo proper as I wiſhed, it was drilled on the ſide of a field, the ſoil of which was light and ſandy, and in ſuch bad order, that the preceding crop was a very indifferent one. It was therefore manured with a compoſt dung-hill.

"After croſs-ploughing and manuring, it was laid into four and a half feet ridges, then harrowed and drilled with one peck and a half of wheat on an acre and a quarter, which is nearly one peck and a fifth per Engliſh acre. It was drilled the 27th of October, and rolled after drilling. The crop was late in its appearance, and very backward in the ſpring.

“ March 31ſt, it was horſe-hoed one furrow *from* the rows.

“ April 8th, it was hand-hoed and weeded in the rows.

“ 25th, horſe-hoed again, laying a furrow back *to* the rows.

“ May 15th, hand-hoed the ſecond time.

“ June 2d, horſe-hoed *from* the rows.

“ June 12th, hand-hoed the third time.

“ July 14th, horſe-hoed *to* the rows.

“ At this laſt hoeing, as many of the ears were beaten down into the intervals by wind and rain, a man went before the horſe-hoe, and turned the ears back into their proper place.

“ The crop, when reaped and threſhed, yielded me 36 buſhels on one acre and a quarter, which is 28 buſhels and three pecks per acre; and the produce from one peck and an half 96 for one.

“ As the produce appeared ſo great, from land in ſuch bad order, it was carefully meaſured again, and found to be right. But this increaſe, though great, was not ſo large as Mr Crake of Glaſgow had without dung.

“ Mr Randal ſays, ‘ It is an experimented fact, that on a fine loam exquiſitely prepared, 144 buſhels have been produced from one acre. And I believe, it is not known what the increaſe may be brought to in rich lands by high cultivation.’

“ Some years ſince, I had beans dropt alternately with potatoes, at two feet diſtance in the rows, which were three feet apart, and ploughed in the intervals. The land adjoining was ſown with beans and peaſe, which were a good crop; but thoſe ſown among the potatoes a better one. I pulled one ſtem of the beans planted with the potatoes, which had three branches riſing from the bottom, and it produced 225 beans. In all the trials of drilled beans, moſt of the ſtems had two branches, with many pods upon each.——From theſe and other inſtances, I believe it is not yet known to what increaſe grain may be brought by drilling, good cultivation, and manure.

“ Horſe-hoeing is certainly preferable to cloſe drilling or hand-hoeing; but the latter is ſuperior to broad-caſt.

“ Horſe-hoeing the full depth increaſes the crop, by making it tiller and branch more than it otherwiſe would do; and the advantage is diſtinctly obſervable every hoeing, by the colour of the grain. It prepares the ground for the next crop, at the ſame time that it increaſes the crop growing, which hand-hoeing does not, although it may deſtroy the weeds. Thus drilled ground is kept in a looſe open ſtate to receive the benefit of the influence of the air and weather, which broad-caſt has not; and it is evident from certain experience, that crops may be drilled many years to good advantage without manure.

“ Suppoſe the crops only 20 buſhels per acre, what courſe of broad-caſt crops will give 5l. an acre for the courſe? But ſuppoſe they are dunged the ſame as any ground in the moſt approved courſe, there is the greateſt reaſon to expect as much as in the above experiment, which is 28 and three-quarters, and at 5s. per buſhel amounts to 7l. 3s. 9d.

“ Calculations may be of ſervice to thoſe who wiſh to try drilling, and have few books to direct them.

“ One acre is ten chains long, of 660 feet, or 220 yards long, and one yard broad, containing 4840 ſquare yards. Then if the ridge is four feet ſix inches, this makes 14 ridges, and three feet to ſpare. This length of 220 yards, multiplied by 14 (the number of ridges) gives a length of yards 3080, to which add 146 for the ſpare three feet, and it will be 3226 yards. And as two rows are drilled on a ridge, the number of rows will be in length 6452 yards; but as a deduction of 172 yards muſt be made for the head ridges, ſuppoſe three yards each, &c. the whole length to be ſown will be 6280 yards clear. Now a gallon (Wincheſter) holds about 80,000 grains. The quantity recommended by be drilled by Mr Forbes and others, being ſix gallons, or two-thirds of a buſhel per acre, is nearly 78 grains to a yard, or 26 to a foot. But in my experiment, by this calculation, it was only about 11 grains to a foot; which is quite ſufficient, if the ſeed be good, and it be not deſtroyed by vermin.

“ Now with regard to the quantity of land this drill-plough may ſow; if a horſe walks at the rate of two miles per hour, he goes 16 miles in eight hours, or 28,460 yards. As he ſows two ridges at once, this is ſeven lengths and two-thirds per acre, or 1686 yards to ſow an acre, being nearly 17 acres in a day.

“ Four horſe-hoeings are calculated equal to two ploughings. In plain ploughing they ſuppoſe the ridge is ploughed with four furrows, or eight for twice ploughing. The four horſe hoeings are eight furrows, equal to two ploughings.

“ Mr Tull directs four hoeings, and Mr. Forbes five. Firſt, In November, when the plant has four blades. 2dly, In March, deep, and nearer the rows than the former; both theſe hoeings ſhould be *from* the rows. 3dly, Hand-hoed when it begins to ſpindle, if the earth be crumbly, *to* the rows. 4thly, When it begins to bloſſom, *from* the rows, but as near to them as in the ſecond hoeing. 5thly, When done bloſſoming, to ripen and fill the grain, *to* the rows.

“ The laſt hoeing Mr Tull does not direct, but Mr Forbes adviſes it, as being of eſſential ſervice in filling the grain, and ſaving trouble in making the next ſeed-furrows. They adviſe the patent or ſowing-plough for horſe-hoeing; and the expence is calculated by Mr Crake at one guinea per acre, reaping included.

“ But let us ſuppoſe the following, which are the prices in the county I live in (Fife).

	£.	s.	d.
Ploughing to form the ridges, -	0	4	0
Harrowing, - - -	0	0	4
Four hoeings, equal to two ploughings,	0	8	0
Sowing, - - -	0	0	4
Hand-hoeing twice, - -	0	8	0
Seed, one peck and a half, at 5s. a buſhel,	0	1	10
Whole expence per acre, - £.	1	2	6”

Drill-huſbandry is, as a good writer has juſtly defined it, “ *the practice of a garden brought into the field.*” Every man of the leaſt reflection muſt be ſenſible, that the practice of the garden is much *better* than that of the field, only a little more expenſive; but if (as is the caſe) this extra expence be generally much more than repaid by the ſuperior goodneſs and value of drilled crops, it ought to have no weight in comparing the two modes of huſbandry.

Practice.

In the broad-caſt method the land is often ſown in bad tilth, and always ſcattered at random, ſometimes by very unſkilful hands. In drilling, the land muſt be in fine order; the ſeed is ſet in trenches drawn regularly, all of nearly an equal depth, and that depth ſuited to the nature of each kind of ſeed. Theſe ſeeds are alſo diſtributed at proper diſtances, and by being equally and ſpeedily covered, are protected from vermin and other injuries; ſo that the practice of the garden is here exactly introduced into the field.

In the broad-caſt method the ſeed falls in ſome places too thick, in others too thin; and being imperfectly covered, a part of it is devoured by vermin which follow the ſower; another part is left expoſed to rain or froſt, or to heats, which greatly injure it. When harrowed, a great part of it (ſmall ſeeds eſpecially) is buried ſo deep, that if the ſoil be wet, it periſhes before it can vegetate.

Again: When thus ſown, there is no meddling with the crop afterwards, becauſe its growth is irregular. The ſoil cannot be broken to give it more nouriſhment, nor can even the weeds be deſtroyed without much inconvenience and injury.

But in the drill-huſbandry the intervals between the rows, whether double or ſingle, may be horſe-hoed; and thereby nouriſhment may repeatedly be given to the plants, and the weeds almoſt totally deſtroyed.

The very ſame effects which digging has upon young ſhrubs and trees in a garden, will reſult from horſe-hoeing in a field, whether the crop be corn or pulſe: For the reaſon of the thing is the ſame in both caſes, and being founded in nature and fact, cannot ever fail. In drilling, no more plants are raiſed on the ſoil than it can well ſupport; and by dividing and breaking the ground they have the full advantage of all its fertility.

The plough prepares the land for a crop, but goes no further; for in the broad-caſt huſbandry it cannot be uſed: but the crop receives greater benefit from the tillage of the land by the horſe-hoe, while it is growing, than it could in the preparation. No care in tilling the land previous to ſowing can prevent weeds riſing with the crop; and if theſe weeds be not deſtroyed while the crop is growing, they will greatly injure it. In the broad-caſt huſbandry this cannot be done; but in drilling, the horſe-hoe will effect it eaſily.

And what adds to the farmer's misfortune is, that the moſt pernicious weeds have ſeeds winged with down which are carried by the wind to great diſtances; ſuch as thiſtles, ſow-thiſtles, colts-foot, and ſome others.

If the expence of horſe-hoeing be objected, there are two anſwers which may very properly be made: The firſt is, that this expence is much leſs than that of hand-hoeing were it practicable, or of hand-weeding. The ſecond is, that it is more than repaid by the quantity of ſeed ſaved by drilling; to ſay nothing of the extra quantity and goodneſs of the crops, which are generally ſelf-evident.

Upon the whole: If the particular modes of cultivating land by the new huſbandry ſhould, after all, be conſidered as perhaps too limited to be univerſally adopted; yet it has been of great uſe in raiſing ſuſpicions concerning the old method, and in turning the views of philoſophers and farmers towards improving in general. Many real improvements in agriculture have been the conſequences of theſe ſuſpicions; and as this ſpirit of inquiry remains in full vigour, a ſolid foundation is laid for expecting ſtill further improvements in this uſeful art.

Agrifolium
Agrigentum.

AGRIFOLIUM, or AQUIFOLIUM. See ILEX.

AGRIGENTUM, (anc. geog.), a city of Sicily, part of the ſite of which is now occupied by a town called *Girgenti* from the old name. See GIRGENTI.

According to ancient authors, Dedalus, the moſt famous mechanician of fabulous antiquity, fled to this ſpot for protection againſt Minos, and built many wonderful edifices for Cocalus king of the iſland. Long after his flight, the people of Gela ſent a colony hither 600 years before the birth of Chriſt; and from the name of a neighbouring ſtream called the new city *Acragas*, whence the Romans formed their word *Agrigentum*. Theſe Greeks converted the ancient abode of the Siculi into a citadel to guard the magnificent city, which they erected on the hillocks below.

An advantageous ſituation, a free government with all its happy effects, and an active commercial ſpirit, exalted their commonwealth to a degree of riches and power unknown to the other Greek ſettlements, Syracuſe alone excepted. But the proſperity of Agrigentum appears to have been but of a ſhort duration, and tyranny ſoon deſtroyed its liberty.

Phalaris was the firſt that reduced it to ſlavery. His name is familiar to moſt readers on account of his cruelty, and the brazen bull in which he tortured his enemies: (See PHALARIS.)—Phalaris met with the common fate of tyrants, and after his death the Agrigentines enjoyed their liberty for 150 years; at the expiration of which term Thero uſurped the ſovereign authority. The moderation, juſtice, and valour of this prince preſerved him from oppoſition while living, and have reſcued his memory from the obloquy of poſterity. He joined his ſon-in-law Gelo, king of Syracuſe, in a war againſt the Carthaginians; in the courſe of which victory attended all his ſteps, and Sicily ſaw herſelf for a time delivered from her African oppreſſions. Soon after his deceaſe, his ſon Thraſydeus was deſpoiled of the diadem, and Agrigentum reſtored to her old democratical government. Ducetius next diſturbed the general tranquillity. He was a chief of the mountaineers, deſcendants of the Siculi; and was an overmatch for the Agrigentines while they were unſupported by alliances, but ſank under the weight of their union with the Syracuſans. Some trifling altercations diſſolved this union, and produced a war, in which the Agrigentines were worſted, and compelled to ſubmit to humiliating terms of peace. Reſentment led them to embrace with joy the propoſals of the Athenians, then meditating an attack upon Syracuſe. Their new friends ſoon made them feel that the ſacrifice of liberty and fortune would be the price of their protection; and this conſideration brought them ſpeedily back to their old connections. But as if it had been decreed that all friendſhip ſhould be fatal to their repoſe, the reconciliation and its effects drew upon them the anger of the Carthaginians. By this enemy their armies were routed, their city taken, their race almoſt extirpated, and ſcarce a veſtige of magnificence was left. Agrigentum lay 50 years buried under its own ruins; when Timoleon, after triumphing over the Carthaginians, and reſtoring liberty to Sicily, collected the deſcendants of the Agrigentines, and ſent them to re-eſtabliſh the dwellings of their forefathers. Their exertions were rewarded with aſtoniſhing ſucceſs; for Agrigentum roſe from its aſhes with ſuch a renewal of vigour, that in a very ſhort time we find it engaged in the bold ſcheme of ſeizing a lucky moment, when Agathocles and Carthage had reduced Syracuſe to the loweſt ebb, and arrogating to itſelf ſupremacy over all the Sicilian republics. Xenodicus was appointed the leader of this arduous enterpriſe; and had his latter operations been as fortunate as his firſt campaign, Agrigentum would have acquired ſuch a preponderance of reputation and power, that the rival ſtates would not even have dared to attack it. But a few brilliant exploits were ſucceeded by a ſevere overthrow; the Agrigentines loſt courage, diſagreed in council, and humbly ſued for peace to Agathocles. This commonwealth afterwards took a ſtrong part with Pyrrhus; and when he left Sicily to the mercy of her enemies, threw itſelf into the arms of Carthage. During the firſt Punic war, Agrigentum was the head-quarters of the Carthaginians, and was beſieged by the Roman conſuls, who after eight months blockade took it by ſtorm. It nevertheleſs changed maſters ſeveral times during the conteſt between thoſe rival ſtates, and in every inſtance ſuffered moſt cruel outrages. After this period very little mention of it occurs in hiſtory, nor do we know the preciſe time of the deſtruction of the old city and the building of the new one. See GIRGENTI.

The principal part of the ancient city lay in the vale; the preſent town, called Girgenti, occupies the mountain on which the citadel of Cocalus ſtood.

It was difficult to be more judicious and fortunate in the choice of ſituation for a large city. The inhabitants were here provided with every requiſite for defence, pleaſure, and comfort of life; a natural wall, formed by abrupt rocks, preſented a ſtrong barrier againſt aſſailants; pleaſant hills ſheltered them on three ſides without impeding the circulation of air; before them a broad plain watered by the Acragas, gave admittance to the ſea-breeze, and to a noble proſpect of that awful element; the port or emporium lay in view at the mouth of the river, and probably the road acroſs the flat was lined with gay and populous ſuburbs.

The hoſpitality and parade for which the Agrigentines are celebrated in hiſtory were ſupported by an extenſive commerce; by means of which, the commonwealth was able to reſiſt many ſhocks of adverſity, and always to riſe again with freſh ſplendour. It was, however, cruſhed by the general fall of Grecian liberty; the feeble remnants of its population, which had ſurvived ſo many calamities, were at length driven out of its walls by the Saracens, and obliged to lock themſelves up for ſafety among the bleak and inacceſſible rocks of the preſent city.

At the north-eaſt angle of the ancient limits, upon ſome foundations of large regular ſtones, a church has been erected; a road appears hewn in the ſolid rock for the convenience of the votaries that viſited this temple in ancient days. It was then dedicated to Ceres and her daughter Proſerpine, the peculiar patroneſſes of Sicily. Biſhop Blaiſe has ſucceeded to their honours.

At the ſouth-eaſt corner, where the ground, riſing gradually, ends in a bold eminence, which is crowned with majeſtic columns, are the ruins of a temple ſaid to have been conſecrated to Juno. To the weſt of this, ſtands the building commonly called the *Temple of Concord;* the ſtone of which, and the other buildings, is the ſame as that of the neighbouring mountains and cliffs, a conglutination of ſea-ſand and ſhells, full of perforations, of a hard aud durable texture, and a deep reddiſh brown colour. This Doric temple has all its columns, entablature, pediments, and wall entire; only part of the roof is wanting. It owes its preſervation to the piety of ſome Chriſtians, who have covered half the nave, and converted it into a church conſecrated under the invocation of St Gregory, biſhop of Girgenti.

Proceeding in the ſame direction, you walk between rows of ſepulchres cut in the rock wherever it admitted of being excavated by the hand of man, or was ſo already by that of nature. Some maſſes of it are hewn into the ſhape of coffins; others drilled full of ſmall ſquare holes employed in a different mode of interment, and ſerving as receptacles of urns. One ponderous piece of the rock lies in an extraordinary poſition; by the failure of its foundation, or the ſhock of an earthquake, it has been looſened from the general quarry, and rolled down the declivity, where it now remains ſupine with the cavities turned upwards. Only a ſingle column marks the confuſed heap of moſs-grown ruins belonging to the temple of Hercules. It ſtood on a projecting rock above a chaſm in the ridge, which was cut through for a paſſage to the emporium.

In the ſame tract, over ſome hills, is ſituated the building uſually called the tomb of Thero. It is ſurrounded by aged olive-trees, which caſt a wild irregular ſhade over the ruin. The edifice inclines to the pyramidical ſhape, and conſiſts at preſent of a triple plinth, and a baſe ſupporting a ſquare pedeſtal; upon this plain ſolid foundation is raiſed a ſecond order, having a window in each front, and at each angle two Ionic pilaſters crowned with an entablature of the Doric order. Its inſide is divided into a vault, a ground room, and one in the Ionic ſtory, communicating with each other by means of a ſmall internal ſtaircaſe.

In the plain are ſeen the fragments of the temple of Eſculapius; part of two columns and two pilaſters, with an intermediate wall, ſupport the end of a farmhouſe, and were probably the front of the cella. Purſuing the track of the walls towards the weſt, you arrive at a ſpot which is covered with the gigantic remains of the temple of Jupiter the Olympian, minutely deſcribed by Diodorus Siculus. It may literally be ſaid that it has not one ſtone left upon another; and it is barely poſſible, with the help of much conjecture, to diſcover the traces of its plan and dimenſions. Diodorus calls it the largeſt temple in the whole iſland: but adds, that the calamities of war cauſed the work to be abandoned before the roof could be put on; and that the Agrigentines were ever after reduced to ſuch a ſtate of poverty and dependence, that they never had it in their power to finiſh this ſuperb monument of the taſte and opulence of their anceſtors. The length of this temple was 370 Greek feet, its breadth 60, and its height 220, excluſive of the foundations or baſement ſtory; the extent and ſolidity of its vaults and underworks were wonderful; its ſpacious porticos and exquiſite ſculpture were ſuited to the grandeur of the whole. It was not built in the uſual ſtyle of Sicilian temples with a cella of maſſive walls and a peryſtile, but was deſigned in a mixt taſte with half columns let into the walls on the outſide, the inſide exhibiting a plain ſurface.

The next ruin belongs to the temple of Caſtor and Pollux; vegetation has covered the lower parts of the building, and only a few fragments of columns appear between the vines. This was the point of the hill where the wall ſtopt on the brink of a large fiſh-pond ſpoken of by Diodorus; it was cut in the ſolid rock 30 feet deep, and water was conveyed to it from the hills. In it was bred a great quantity of fiſh for the uſe of public entertainments; ſwans and various other kinds of wild fowl ſwam along its ſurface, for the amuſement of the citizens, and the great depth of water prevented an enemy from ſurpriſing the town on that ſide. It is now dry and uſed as a garden. On the oppoſite bank are two tapering columns without their capitals, moſt happily placed in a tuft of carob trees. Monte Toro, where Hanno encamped with the Carthaginian army, before the Roman conſuls drew him into an engagement that ruined his defenſive plan, is a noble back-ground to this picturesque group of objects. —The whole ſpace comprehended within the walls of the ancient city abounds with traces of antiquity, foundations, brick-arches, and little channels for the conveyance of water; but in no part are any ruins that can be preſumed to have belonged to places of public entertainment. This is the more extraordinary, as the Agrigentines were a ſenſual people, fond of ſhews and dramatic performances, and the Romans never dwelt in any place long without introducing their ſavage games. Theatres and amphitheatres ſeem better calculated than moſt buildings to reſiſt the outrages of time; and it is ſurpriſing that not even the veſtiges of their form ſhould remain on the ground.

AGRIMONIA, Agrimony: A genus of the digynia order, belonging to the dodecandria claſs of plants; and in the natural method ranking under the 35th order, *Senticoſæ*. The characters are theſe: The *calyx* is a monophyllous perianthium, divided into five acute ſegments, perſiſtent, and fenced with another calyx: The *corolla* conſiſts of five petals, flat, and crenated at the ends: The *ſtamina* have ten capillary filaments, ſhorter than the corolla, and inſerted into the calyx; the antheræ are ſmall, didymous, and compreſſed: The *piſtillum* has a germen beneath; the ſtyli are two, ſimple, and the length of the ſtamina: There is no *pericarpium*; the calyx is contracted in the neck, and indurated: The ſeeds are two, and roundiſh. Of this genus there are five ſpecies enumerated by botanical writers; but none of them have any remarkable properties except the two following.

Species and properties. 1. The eupatoria, or common agrimony, grows naturally in ſeveral parts of Britain by the ſides of hedges and of woods. It is eat by ſheep and goats, but refuſed by horſes and ſwine. The Canadians are ſaid to uſe an infuſion of the root in burning fevers with great ſucceſs. An infuſion of ſix ounces of the crown of the root in a quart of boiling water, ſweetened with honey, and half a pint of it drank three times a-day, is an effectual cure for the jaundice, according to Dr Hill. He adviſes to begin with a vomit, afterwards to keep the belly ſoluble, and to continue the medicine as long as any ſymptoms of the diſeaſe remain. It is ſaid to be an aperient, detergent, and ſtrengthener of the viſcera. Hence it is recommended in ſcorbutic diſorders, in debility and laxity of the inteſtines, &c. Digeſted in whey, it affords an uſeful diet-drink for the ſpring-ſeaſon, not ungrateful to the palate or ſtomach. Doctor Alſton ſays, that the beſt mode of adminiſtering this herb is in powder, when the intention is to corroborate; and that if thus taken in a large quantity, we may expect many of the effects of the bark from it in agues.

2. The odorata, or ſweet-ſcented agrimony. This grows near four feet high; the leaves have more pinæ than the former; the ſerratures of the leaves are alſo ſharper, and, when handled, they emit an agreeable odour. The leaves of this ſpecies make an agreeable cooling tea, which is ſometimes preſcribed by phyſicians as a drink for people in fevers.

Culture. Both theſe ſpecies may be propagated either by ſeed, or by parting the roots in autumn when the leaves begin to decay. The ſeeds ought alſo to be ſown in this ſeaſon; for if kept out of the ground till ſpring, they ſeldom come up that year.—Agrimony is a hardy perennial plant, and will thrive in almoſt any ſoil or ſituation; but the plants ſhould not be placed nearer one another than two feet, that the roots may have room to ſpread.

Hemp Agrimony. See Eupatorium.

Water Hemp-Agrimony. See Bidens.

AGRIONIA, in Grecian antiquity, feſtivals annually celebrated, by the Bœotians, in honour of Bacchus. At theſe feſtivals, the women pretended to ſearch after Bacchus as a fugitive; and, after ſome time, gave over their enquiry, ſaying, that he was fled to the Muſes, and was concealed among them.

AGRIOPHAGI, in antiquity, a name given to thoſe who fed on wild beaſts. The word is Greek, compounded of αγριος, "wild," "ſavage," and φαγω, "I eat." The name is given, by ancient writers, to certain people, real or fabulous, ſaid to have fed altogether on lions and panthers. Pliny and Solinus ſpeak of *Agriophagi* in Ethiopia, and Ptolemy of others in India on this ſide the Ganges.

AGRIPPA, in midwifery, a term applied to children, brought forth with their feet foremoſt.

Agrippa (Herod), the ſon of Ariſtobulus and Mariamne, and grandſon to Herod the Great, was born in the year of the world 3997, three years before the birth of our Saviour, and ſeven years before the vulgar æra. After the death of Ariſtobulus his father, Joſephus informs us, that Herod his grandfather took care of his education, and ſent him to Rome to make his court to Tiberius. The emperor conceived a great affection for Agrippa, and placed him near his ſon Druſus. Agrippa very ſoon won the graces of Druſus, and of the empreſs Antonia. But Druſus dying ſuddenly, all thoſe who had been much about him were commanded by Tiberius to withdraw from Rome, leſt the ſight and preſence of them ſhould renew his affliction. Agrippa, who had indulged his inclination to liberality, was obliged to leave Rome overwhelmed with debts, and in a very poor condition. He did not think it fit to go to Jeruſalem, becauſe he was not able to make a figure there ſuitable to his birth. He retired therefore to the caſtle of Maſſada, where he lived rather like a private perſon than a prince. Herod the Tetrarch, his uncle, who had married Herodias his ſiſter, aſſiſted him for ſome time with great generoſity. He made him principal magiſtrate of Tiberias, and preſented him with a large ſum of money; but all this was not ſufficient to anſwer the exceſſive expences and profuſion of Agrippa; ſo that Herod growing weary of aſſiſting him, and reproaching him with his bad œconomy, Agrippa took a reſolution to quit Judea and return to Rome. Upon his arrival, he was received into the good graces of Tiberius, and commanded to attend Tiberius Nero the ſon of Druſus. Agrippa, however, having more inclination for Caius the ſon of Germanicus, and grandſon of Antonia, choſe rather to attach himſelf to him; as if he had ſome prophetic views of the future elevation of Caius, who at that time was beloved by all the world. The great aſſiduity and agreeable behaviour of Agrippa ſo far engaged this prince, that he kept him continually about him.

Agrippa being one day overheard by Eutyches, a ſlave whom he had made free, to expreſs his wiſhes for Tiberius's death and the advancement of Caius, the ſlave betrayed him to the Emperor; whereupon Agrippa was loaded with fetters, and committed to the cuſtody of an officer. Tiberius ſoon after dying, and Caius Caligula ſucceeding him, the new Emperor heaped many favours and much wealth upon Agrippa; changed his iron fetters into a chain of gold; ſet a royal diadem upon his head; and gave him the tetrarchy which Philip, the ſon of Herod the Great, had been poſſeſſed of, that is, Batanæa and Trachonitis. To this he added that of Lyſanias; and Agrippa returned very ſoon into Judea to take poſſeſſion of his new kingdom.

Caius being ſoon after killed, Agrippa, who was then at Rome, contributed much by his advice to maintain Claudius in poſſeſſion of the imperial dignity, to which he had been advanced by the army. But in this affair Agrippa acted a part wherein he ſhowed more cunning and addreſs than ſincerity and honeſty; for while he made a ſhow of being in the intereſt of the ſenate, he ſecretly adviſed Claudius to be reſolute, and not to abandon his good fortune. The Emperor, as an acknowledgment for his kind offices, gave him all Judea and the kingdom of Chalcis, which had been poſſeſſed by Herod his brother. Thus Agrippa became of a ſudden one of the greateſt princes of the Eaſt; and was poſſeſſed of as much, if not more, territories than had been held by Herod the Great his grandfather. He returned to Judea, and governed it to the great ſatisfaction of the Jews. But the deſire of pleaſing them, and a miſtaken zeal for their religion, induced him to commit an unjuſt action, the memory of which is preſerved in Scripture, Acts xii. 1, 2, &c. for about the feaſt of the paſſover, in the year of Jeſus Chriſt 44, St James major, the ſon of Zebedee and brother to St John the Evangeliſt, was ſeized by his order and put to death. He proceeded alſo to lay hands on St. Peter, and impriſoned him, waiting till the feſtival was over, that he might then have him executed. But God having miraculouſly delivered St Peter from the place of his confinement, the deſigns of Agrippa were fruſtrated. After the paſſover, this prince went from Jeruſalem to Cæſarea, and there had games performed in honour of Claudius. Here the inhabitants of Tyre and Sidon waited on him to ſue for peace. Agrippa being come early in the morning to the theatre, with a deſign to give them audience, ſeated himſelf on his throne, dreſſed in a robe of ſilver-tiſſue, worked in the moſt admirable manner. The riſing ſun darted on it with its rays, and gave it ſuch a luſtre as the eyes of the ſpectators could not endure. When therefore the king ſpoke to the Tyrians and Sidonians, the paraſites around him began to ſay, that it was the voice of a god, and not that of a man. Inſtead of rejecting theſe impious flatteries, Agrippa received them with an air of complacency; but at the ſame time obſerved an owl above him on a cord. He had ſeen the ſame bird before when he was in bonds by order of Tiberius; and it was then told him, that he ſhould be ſoon ſet at liberty: but that whenever he ſaw the ſame thing a ſecond time, he ſhould not live above five days afterwards. He was therefore extremely terrified; and he died at the end of five days, racked with tormenting pains in his bowels, and devoured with worms. Such was the death of Herod Agrippa, after a reign of ſeven years, in the year of Chriſt 44.

Agrippa II. ſon of the preceding Herod, was made king of Chalcide; but three or four years after, he was deprived of that kingdom by Claudius, who gave him in the place of it other provinces. In the war Veſpaſian carried on againſt the Jews, Herod ſent him a ſuccour of 2000 men; by which it appears, that, tho' a Jew by religion, he was yet entirely devoted to the Romans, whoſe aſſiſtance indeed he wanted, to ſecure the peace of his own kingdom. He lived to the third year of Trajan, and died at Rome A. C. 100. He was the ſeventh and laſt king of the family of Herod the Great. It was before him and Berenice his ſiſter, that St Paul pleaded his cauſe at Cæſarea.

Agrippa (Marcus Veſpanius), ſon-in-law to Auguſtus, of mean birth, but one of the moſt conſiderable generals among the Romans. Auguſtus's victory over Pompey and Mark Anthony was owing to his counſel: he adorned the city with the pantheon, baths, aqueducts, &c.

Agrippa (Cornelius), born at Cologne in 1486, a man of conſiderable learning, and by common report a great magician; for the monks at that time ſuſpected every thing of hereſy or ſorcery which they did not underſtand. He compoſed his *Treatiſe of the Excellence of Women*, to inſinuate himſelf into the favour of Margaret of Auſtria, governeſs of the Low-Countries. He accepted of the charge of hiſtoriographer to the emperor, which that princeſs gave him. The treatiſe of the *Vanity of the Sciences*, which he publiſhed in 1530, enraged his enemies extremely; as did that of *Occult Philoſophy*, which he printed ſoon after at Antwerp. He was impriſoned in France for ſomething he had written againſt Francis I.'s mother, but was enlarged, and went to Grenoble, where he died in 1534. His works are printed in two volumes octavo.

AGRIPPINA, daughter of Germanicus, ſiſter of Caligula, and mother of Nero; a woman of wit, but exceſſively lewd. She was thrice married, the laſt time to Claudius her own uncle, whom ſhe poiſoned to make way for Nero her ſon. Nero afterward cauſed her to be murdered in her chamber, when ſhe bid the executioner ſtab her firſt in the belly that had brought forth ſuch a monſter.

Agrippina colonia ubiorum (anc. geog.), now *Cologne*: ſo called from Agrippina, the daughter of Germanicus, and mother of Nero, who had a colony ſent thither at her requeſt by the emperor Claudius, to honour the place of her birth. See Cologne.

AGRIPPINIANS, in church-hiſtory, the followers of Agrippinus biſhop of Carthage, in the third century, who firſt introduced and defended the practice of rebaptization.

AGROM, a diſeaſe frequent in Bengal and other parts of the Indies, wherein the tongue chaps and cleaves in ſeveral places, being extremely rough withal, and ſometimes covered with white ſpots. The Indians are very fearful of this diſeaſe, which they attribute to extreme heat of the ſtomach. Their remedy is, to drink ſome chalybeate liquor, or the juice of mint.

AGROSTEMA, Wild Lychnis, or Campion; A genus of the pentagynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* is a ſingle-leaved perianthium; leathery, tubular, quinquedentated, and perſiſtent: The *corolla* conſiſts of five ungulated petals: The *ſtamina* have ten ſubulated filaments; the antheræ are ſimple: The *piſtillum* has an egg-ſhaped germen; the ſtyli are five, filiform, erect, and the length of the ſtamina; the ſtigmata are ſimple: The *pericarpium* is an oblong covered capſule, having two cells and five valves: The *ſeeds* are numerous and kidney-ſhaped; the receptacula are as many as the ſeeds, the interior ones gradually longer.

Species. The moſt remarkable are, 1. The githago, hairy wild lychnis, or common campion, which grows naturally in corn-fields in moſt parts of Britain. The flowers appear in June, are generally purple, ſometimes white, and by cultivation yellow.

2. The coronaria, or ſingle-roſe campion. Of this ſpecies there are four varieties; one with deep red, another with fleſh-coloured, a third with white flowers; and a ſort with double flowers, which has turned moſt of the others out of the gardens.

3. The flos jovis, or umbelliferous mountain-campion, grows naturally upon the Helvetian mountains. It is a low plant with woolly leaves: the flower-ſtem riſes near a foot high; the flowers grow in umbels on the top of the ſtalk, and are of a bright red colour. They appear in July, and the ſeeds ripen in September.

Culture. The firſt and third ſpecies are annual plants, ſo muſt be propagated by ſeeds; but as the firſt is found naturally in corn fields, it is very ſeldom cultivated in gardens; the third ſort ſhould have a ſhady ſituation, and thrives beſt in a ſtrong ſoil. The ſecond ſpecies is perennial, but only thoſe varieties which have ſingle flowers produce any ſeeds; the double kind, therefore, as it produces no ſeeds, muſt be propagated by parting the roots in autumn, after the flowers are paſt. In doing this, every head which can be ſlipped off with roots ſhould be parted: theſe ſhould be planted in a border of freſh undunged earth, at the diſtance of ſix inches one from the other, obſerving to water them gently until they have taken root; after which they will require no more; for much wet is very injurious to them, as is alſo dung. In this border they may remain till ſpring, when they ſhould be planted in the borders of the flower-garden, where they will be very ornamental during the time of their flowering, which is in July and Auguſt.—This plant is eat by horſes, goats, and ſheep.

AGROSTIS, Bent-grass, in botany: A genus of the triandria order, belonging to the digynia claſs of plants; and, in the natural method, ranking under the 4th order, *Gramina*. The characters are; The *calyx* is a one-flowered, two-valved, pointed gluma, rather leſs than the corolla. The *corolla* is two-valved and pointed. The *ſtamina* have three capillary filaments, which are larger than the corolla. The *antheræ* are forked. The *piſtillum* has a roundiſh germen; the ſtyli are two, reflected, and villous; the ſtigmata hiſped longitudinally. The *pericarpium* is the corolla growing to the ſeed, not gaping. The *ſeed* is one, globular, and pointed at both ends. There are 15 ſpecies; eight of them natives of Britain.

AGROSTOGRAPHIA, ſignifies the hiſtory or deſcription of graſſes. See Grass.

AGROUND, the ſituation of a ſhip whoſe bottom, or any part of it, hangs, or reſts upon the ground, ſo as to render her immoveable, till a greater quantity of water floats her off, or till ſhe is drawn out into the ſtream by the application of mechanical powers.

AGRYPNIA, among phyſicians, implies an inaptitude to ſleep; a troubleſome ſymptom of feveriſh and other diſorders.

Agrypnia, in the Greek church, implies the vigil of any of the greater feſtivals.

AGUE, a general name for all periodical fevers, which, according to the different times of the returns of the feveriſh paroxyſm, are denominated tertian, quartian, and quotidian. See Medicine (*Index*).

Ague-*Cake*, the popular name for a hard tumour on the left ſide of the belly, lower than the falſe ribs, ſaid to be the effect of intermitting fevers.

Ague-*Tree*, a name given to the ſaſſafras, on account of its febrifuge qualities.

AGUEPERSE, a town of France, ſituated on the Lyonnois, about 15 miles north of Clermont.

AGUILLANEUF, or Augillaneuf, a form of rejoicing uſed among the ancient Franks on the firſt day of the year. The word is compounded of the French *A* "to," *gui* "miſleto," and *l'an neuf* "the new year." Its origin is traced from a druid-ceremony: the prieſts uſed to go yearly in December, which with them was reputed a ſacred month, to gather miſleto of the oak in great ſolemnity. The prophets marched in the front, ſinging hymns in honour of their deities;

after them came a herald with a caduceus in his hand; theſe were followed by three druids a-breaſt, bearing the things neceſſary for ſacrifice; laſt of all came the chief or arch druid, accompanied with the train of people. The chief druid climbing the oak, cut off the miſleto with a golden ſickle, and the other druids received it in a white cloth; on the firſt day of the year it was diſtributed among the people, after having bleſſed and conſecrated it by crying *A gui l'an neuf*, to proclaim the new year. This cry is ſtill continued in Picardy, with the addition of *Plantez, Plantez*, to wiſh a plentiful year. In Burgundy and ſome other parts, the children uſe the ſame word to beg a new-year's gift. Of later times the name *Aguillaneuf* was alſo given to a ſort of begging, practiſed in ſome dioceſes, for church-tapers, on new-year's day, by a troop of young people of both ſexes, having a chief, &c. It was attended with various ridiculous ceremonies, as dancing in the church, &c. which occaſioned the ſynods to ſuppreſs it.

AGUILLAR, a town of Spain in the province of Navarre, about 24 miles weſt of Eſtella.

Aguillar del Campo, a town of Old Caſtile, with the title of marquiſate, about 15 leagues north of the city of Burgos.

AGUILLONIUS (Francis), a Jeſuit born at Bruſſels: he was rector of the Jeſuits college at Antwerp, and eminent for his ſkill in mathematics. He was the firſt who introduced that ſcience among the Jeſuits in the low countries: he wrote a book of Optics, and was employed in finiſhing his Catoptrics and Dioptrics, when death prevented him in 1617.

AGUIRRA (Joſeph Sænz de), a Benedictine, and one of the moſt learned men in the 17th century, was born March 24, 1630. He was cenſor and ſecretary of the ſupreme council of the inquiſition in Spain, and interpreter of the ſcriptures in the univerſity of Salamanca. He printed three volumes in folio upon Philoſophy, a commentary upon Ariſtotle's ten books of Ethics, and other pieces. He died at Rome Auguſt 19, 1699.

AGUL, in botany, a ſynonime of the hedyſarum. See HEDYSARUM.

AGUR. The xxxth chapter of the Proverbs begins with this title: "The words of Agur, the ſon of Jakeh;" which, according to the ſignification of the original terms, may be tranſlated, as the Vulgate has it, *Verba congregantis, filii vomentis*; which tranſlation Le Clerc condemns, ſuppoſing theſe to be proper names, which ought not to be tranſlated. Theſe words are rendered by Lewis de Dieu: "The words of him who has recollected himſelf, the ſon of obedience." The generality of the fathers and commentators will have it, that Solomon deſcribes himſelf under the name of Agur the ſon of Jakeh; others conjecture that Agur, as well as Lemuel (in chap. xxxi. 1.) were wiſe men who lived in the time of Solomon, and were his interlocutors in the book of Proverbs; an opinion which F. Calmet thinks is without the leaſt ſhew of probability, this book being nothing like a dialogue. This laſt expoſitor thinks it probable, that Agur was an inſpired author different from Solomon, whoſe ſentences it was thought fit to join with thoſe of this prince, becauſe of the conformity of their matter.

AGURAH, in Jewiſh antiquity, the name of a ſilver coin, otherwiſe called *gerah* and *keſhita*.

AGURIUM, or AGYRIUM (anc. geog.), a town of Sicily in the Val di Demona, near the river Semetus. The people were called *Populus Agyrinenſis* by Cicero; *Agyrinus* by Pliny. It was the birth-place of Diodorus Siculus, as he himſelf teſtifies; but he calls it *Argyrium*, as it is now called *S. Philippo d'Argirone*, which modern name ſeems to confirm that *Argyrium* is the true reading.

AGUSADURA, in ancient cuſtoms, a fee due from vaſſals to their lord for the ſharpening their ploughing tackle. Anciently the tenants in ſome manors were not allowed to have their rural implements ſharpened by any but whom the lord appointed; for which an acknowledgement was to be paid, called *Aguſadura*, in ſome places *Aguſage*: which ſome take to be the ſame with what was otherwiſe called *Reillage*, from the ancient French *reille*, a ploughſhare.

AGUTI, in zoology, the trivial name of a ſpecies of the mouſe, belonging to the mammalia glires of Linnæus. See MUS.

AGYEI, in antiquity, a kind of obeliſks, ſacred to Apollo, erected in the veſtibles of houſes, by way of ſecurity.

AGYNIANI, in church-hiſtory, a ſect who condemned all uſe of fleſh, and marriage, as not inſtituted by God, but introduced at the inſtigation of the devil. The word is compounded of the privative α and γυνη *woman*. They are ſometimes alſo called *Agynenſes*, and *Agynii*; and are ſaid to have appeared about the year 694. It was no wonder they were of no long continuance. Their tenets coincide in great meaſure with thoſe of the Abelians, Gnoſtics, Cerdonians, and other preachers of chaſtity and abſtinence.

AGYRTÆ, in antiquity, a kind of ſtrolling impoſtors running about the country, to pick up money by telling fortunes at rich men's doors, pretending to cure diſeaſes by charms, ſacrifices and other religious myſteries; alſo to expiate the crimes of their deceaſed anceſtors, by virtue of certain odours and fumigations; to torment their enemies, by the uſe of magical verſes and the like. The word is Greek Αγυρται, formed of the verb αγυρω, *I congregate*; alluding to the practice of Charlatans, who gather a crowd about them.

Agyrtæ, among the Greeks, amount to the ſame with *Æruſcatores* among the Latins, and differ not much from Gypſies in Britain.

AHAB, ſon of Omri king of Iſrael, ſucceeded his father A. M. 3086, and ſurpaſſed all his predeceſſors in impiety and wickedneſs. He married Jezebel the daughter of Ethbaal king of the Zidonians, who introduced the idols of Baal and Aſtarte among the Iſraelites, and engaged Ahab in the worſhip of theſe falſe deities. God, being provoked by the ſins of Ahab, ſent the prophet Elijah to him (1 Kings xvii. 1, *ſeq.*) who declared to him that there would be a famine of three years continuance. The dearth having laſted three years the prophet deſired Ahab to gather all the people to mount Carmel, and with them the prophets of Baal: when they were thus aſſembled, Elijah cauſed fire to deſcend from heaven upon his ſacrifice, after which he obtained of God that it ſhould rain; and then the earth recovered its former fertility. Six years after this, Ben-hadad king of Syria (chap.

xx.) laid ſiege to Jeruſalem. But God, provoked at this proud Syrian, ſent a prophet to Ahab, not only to aſſure him of victory, but to inſtruct him likewiſe in what manner he was to obtain it. Ahab was ordered to review the princes of the provinces, which he found to be a choice company conſiſting of 232 young men, who were to command the people in Samaria, amounting to about 7000 men: with this ſmall army Ahab was directed to fall upon the great hoſt of the Syrians, and that at noon-day, while Ben-hadad and the 32 kings that accompanied him were drinking and making merry. Ben-hadad having notice that they were marching out of the city, ordered them to be brought before him alive, whatever their deſigns were: but the young men, followed by this ſmall army, advanced, and killing all that oppoſed them, ſuch a panic ſeized the Syrian troops, that they began to fly; and even Ben-hadad himſelf mounted his horſe and fled with his cavalry; which Ahab perceiving, purſued them, killed great numbers of them, and took a conſiderable booty. After this the prophet came to Ahab, to animate him with freſh courage, and to caution him to keep upon his guard; aſſuring him, that Ben-hadad would return againſt him the year following. According to this prediction, at the end of the year he returned and encamped at Aphek, with a reſolution to give the Iſraelites battle. Both armies being ranged in order of battle for ſeven days ſucceſſively, at length, upon the ſeventh day, a battle enſued, wherein the Iſraelites killed 100,000 of the Syrians, and the reſt fled to Aphek; but as they were preſſing to get into the city, the walls of Aphek fell upon them and killed 27,000 more. Ben-hadad throwing himſelf upon the mercy of Ahab, this prince received him into his own chariot, and made an alliance with him. The year following, Ahab deſiring to make a kitchen-garden near his palace (chap. xxi.), requeſted of one Naboth, a citizen of Jezreel, that he would ſell him his vineyard, becauſe it lay convenient for him. But being refuſed, he returned in great diſcontentment to his houſe, threw himſelf upon the bed, turned towards the wall, and would eat nothing. Jezebel his wife coming in, aſked the reaſon of his great concern; of which being informed, ſhe procured the death of Naboth, and Ahab took poſſeſſion of his vineyard. As he returned from Jezreel to Samaria, the prophet Elijah, met him, and ſaid, "Haſt thou killed and alſo taken poſſeſſion? Now, ſaith the Lord, In the place where dogs licked up the blood of Naboth, ſhall dogs lick thy blood, even thine. As for Jezebel, of her the Lord ſpake, ſaying, The dogs ſhall eat Jezebel by the wall of Jezreel." Ahab, hearing theſe and other denunciations, rent his clothes, put ſackcloth upon his fleſh, and gave other indications of his ſorrow and repentance. But his repentance was neither ſincere nor perſevering. Two years after theſe things, Jehoſhaphat king of Judah came to Samaria to viſit Ahab (chap. xxii.) at a time when he was preparing to attack Ramoth-gilead, which Ben-hadad king of Syria unjuſtly withheld from him. The king of Iſrael invited Jehoſhaphat to accompany him in his expedition; which that prince agreed to do, but deſired that ſome prophet might firſt be conſulted. Ahab therefore aſſembled the prophets of Baal, in number about 400; who all concurred in exhorting the king to march reſolutely againſt Ramoth-gilead. But Micaiah being alſo conſulted, at Jehoſhaphat's ſuggeſtion, propheſied the ruin of Ahab. Upon this, Ahab gave orders to his people to ſeize Micaiah, and to carry him to Amon the governor of the city, and to Joaſh the king's ſon; telling them in his name, "Put this fellow in priſon, and feed him with the bread of affliction, and with the water of affliction, until I come in peace." But Micaiah ſaid, "If thou return at all in peace, the Lord hath not ſpoken by me." Ahab therefore and Jehoſhaphat marched up to Ramoth-gilead; and the king of Iſrael ſaid unto Jehoſhaphat, "I will diſguiſe myſelf, and enter into the battle, but put thou on thy robes:" for he knew that the king of Syria had commanded two and thirty captains that had rule over his chariots, ſaying, "Fight neither with ſmall nor with great, ſave only with the king of Iſrael." Theſe officers therefore having obſerved that Jehoſhaphat was dreſſed in royal robes, took him for the king of Iſrael, and fell upon him with great impetuoſity: but this prince ſeeing himſelf preſſed ſo cloſely, cried out; and the miſtake being diſcovered, the captains of the king of Syria gave over purſuing him. But one of the Syrian army ſhot a random arrow, which pierced the heart of Ahab. The battle laſted the whole day, and Ahab continued in his chariot with his face turned towards the Syrians. In the mean time, his blood was ſtill iſſuing from his wound, and falling in his chariot; and towards the evening he died: whereupon proclamation was made by ſound of trumpet, that every man ſhould return to his own city and country. The king of Iſrael being dead, was carried to Samaria and buried: but his chariot and the reins of his horſes were waſhed in the fiſhpool of Samaria, and the dogs licked his blood, according to the word of the prophet. Such being the end of Ahab; his ſon Ahaziah ſucceeded him, in the year of the world 3107.

AHÆTULA, the trivial name of a ſpecies of the coluber. See Coluber.

AHASUERUS, or Artaxerxes, the huſband of Eſther; and according to archbiſhop Uſher and F. Calmet, the ſcripture name for Darius, the ſon of Hyſtaſpes, king of Perſia; though Scaliger will have Xerxes to be the huſband of Eſther, or the Ahaſuerus of ſcripture; and Dr Prideaux believes him to be Artaxerxes Longimanus. See Hiſtory of Persia.

AHAZ, king of Judah, the ſon of Jotham, remarkable for his vices and impieties. One of his ſons he conſecrated, by making him paſs through and periſh by the fire, in honour of the falſe god Moloch; and he offered ſacrifices and incenſe upon the high places, upon hills, and in groves. Rezin king of Syria and Pekah king of Iſrael invaded Judea in the beginning of the reign of Ahaz; and having defeated his army and pillaged the country, they laid ſiege to Jeruſalem. When they found that they could not make themſelues maſters of that city, they divided their army, plundered the country and made the inhabitants priſoners of war. Rezin and his part of the confederate army marched with all their ſpoil to Damaſcus; but Pekah with his diviſion of the army having attacked Ahaz, killed 120,000 men of his army in one battle, and carried away men, women, and children, without diſtinction, to the number of 200,000. But as they were carrying thoſe captives to Samaria, the prophet Oded, with the principal inhabitants of the city, came out to meet them; and by their remonſtrances prevailed with them to ſet their priſoners at liberty. At the ſame time, the Philiſtines and Edomites invaded other parts of his land, killed multitudes of the people, and carried off much booty. In this diſtreſſed condition, Ahaz finding no other remedy for his affairs, ſent ambaſſadors to Tiglath-pileſer king of the Aſſyrians; and to engage him to his intereſt, he ſtripped the temple and city of all the gold which he could meet with, and ſent it as a preſent. Accordingly Tiglath-pileſer marched to the aſſiſtance of Ahaz, attacked Rezin and killed him, took his capital Damaſcus, deſtroyed it, and removed the inhabitants thereof to Cyrene.

The misfortunes of this prince had no influence to make him better: on the contrary, in the times of his greateſt affliction, he ſacrificed to the Syrian deities, whom he looked upon as the authors of his calamities, and endeavoured to render propitious to him, by honouring them in this manner. He broke in pieces the veſſels of the houſe of God, ſhut up the gates of the temple, and erected altars in all parts of Jeruſalem. He ſet up altars likewiſe in all the cities of Judah, with a deſign to offer incenſe on them. At length he died, and was buried in Jeruſalem, but not in the ſepulchres of the kings of Judah his predeceſſors; which honour he was deprived of, on account of his iniquitous courſe of life. Hezekiah his ſon ſucceeded him in the year of the world 3278, before Jeſus Chriſt 726.

AHAZIAH, the ſon and ſucceſſor of Ahab king of Iſrael, reigned two years, part alone, and part with his father Ahab, who ordained him his aſſociate in the kingdom a year before his death. Ahaziah imitated his father's impieties (1 Kings xxii. 52, ſeq.), and paid his adoration to Baal and Aſtarte, the worſhip of whom had been introduced in Iſrael by Jezebel his mother. The Moabites, who had been always obedient to the kings of the ten tribes ever ſince their ſeparation from the kingdom of Judah, revolted after the death of Ahab, and refuſed to pay the ordinary tribute. Ahaziah had not leiſure or power to reduce them (2 Kings i. 1, 2, &c.): for about the ſame time, having fallen through a lattice from the top of his houſe, he hurt himſelf conſiderably, and ſent meſſengers to Ekron, in order to conſult Baalzebub, the god of that place, whether he ſhould recover of the indiſpoſition occaſioned by this accident. But the prophet Elijah went to Ahaziah, and declared that he ſhould not recover from his illneſs: and accordingly he died in the year of the world 3108, and Jehoram his brother ſucceeded to the crown.

AHAZIAH, king of Judah, the ſon of Jehoram and Athaliah, ſucceeded his father in the kingdom of Judah in the year of the world 3119. He walked in the ways of Ahab's houſe, to which he was allied, his mother being of that family. He reigned only one year, being ſlain by Jehu the ſon of Nimſhi.

AHEAD, a ſea-term, ſignifying further onward than the ſhip, or at any diſtance before her, lying immediately on that point of the compaſs to which her ſtem is directed. It is uſed in oppoſition to *aſtern*, which expreſſes the ſituation of any object behind the ſhip. See ASTERN.

AHICCYATLI, in zoology, the Indian name of a ſerpent reſembling the rattle-ſnake, only it wants the rattles. It is as fatal in the effect of its poiſon as any known ſpecies of ſerpent.

AHIJAH, the prophet of Shilo. He is thought to be the perſon who ſpoke twice to Solomon from God, once while he was building the temple (1 Kings vi. 11.), at which time he promiſed him his protection; and at another time (*id.* xi. 6.) after his falling into all his irregularities, when God expreſſed his indignation with great threatenings and reproaches. Ahijah was one of thoſe who wrote the annals or hiſtory of this prince (2 Chr. ix. 29.). The ſame prophet declared to Jeroboam that he would uſurp the kingdom (1 Kings xi. 29, &c.), and that two heifers ſhould alienate him from the Lord, meaning the golden calves erected by Jeroboam, one at Dan, the other at Bethel. About the end of Jeroboam's reign, towards the year of the world 3046, Abijah the ſon of that prince fell ſick; upon which Jeroboam ſent his wife to this prophet to inquire what would become of the child. The queen therefore went to Ahijah's houſe in Shilo, diſguiſed: But the prophet, upon hearing the ſound of her feet, ſaid, "Come in, thou wife of Jeroboam, why feigneſt thou thyſelf to be another? for I am ſent to thee with heavy tidings." Then he commanded her to go and tell Jeroboam all the evil that the Lord had declared he would bring upon his houſe for his impieties; that ſo ſoon as ſhe would enter into the city her ſon Abijah ſhould die, and ſhould be the only one of Jeroboam's houſe that ſhould come to the grave or receive the honours of a burial. Ahijah in all probability did not long ſurvive the time of this laſt prophecy; but with the time and manner of his death we are not acquainted.

AHITOPHEL, a native of Gillo, was for ſome time the counſellor of king David, whom he at length deſerted, by joining in the rebellion of Abſalom. This prince, upon his being preferred to the crown by the greateſt part of the Iſraelites, ſent for Ahitophel from Gillo (2 Sam. xv. 12.) to aſſiſt him with his advice in the preſent ſtate of his affairs: for at that time Ahitophel's counſels were received as the oracles of God himſelf (chap. xvi. *ult.*). Nothing gave David more uneaſineſs than this event; and when Huſhai his friend came to wait on him and attend him in his flight, he intreated him to return rather to Jeruſalem, make a ſhow of offering his ſervices to Abſalom, and endeavour to fruſtrate the prudent meaſures which ſhould be propoſed by Ahitophel. When Abſalom was come to Jeruſalem, he deſired Ahitophel to deliberate with his other counſellors upon the meaſures which were proper for him to take. Ahitophel adviſed him in the firſt place to abuſe his father's concubines; ſo that when his party ſhould underſtand that he had diſhonoured his father in this manner, they might conclude that there were no hopes of a reconciliation, and therefore eſpouſe his intereſt more reſolutely. A tent, therefore, being prepared for this purpoſe upon the terraſs of the king's palace, Abſalom, in the ſight of all Iſrael, lay with his father's concubines. The next thing Ahitophel propoſed was in the terms following: "Let me now chooſe out 12,000 men, and I will ariſe and purſue after David this night, and I will come upon him while he is weary and weak-handed, and I will make him afraid, and all the people that are with him ſhall flee, and I will ſmite the king only; and I will bring back all the people unto thee; the man whom thou ſeekeſt is as if all returned; ſo all the people ſhall be in peace." This advice was very agreeable to Abſalom and all the elders of Iſrael. However, Abſalom deſired Huſhai to be called to have his opinion. Huſhai being come, and hearing what advice Ahitophel had given, ſaid, The counſel which Ahitophel has given is not good at this time; what, for the preſent, in my opinion, may do better, is this: Let all Iſrael be gathered unto thee, from Dan even to Beerſheba, as the ſand that is by the ſea for multitude, and put thyſelf in the midſt of them, and wherever David is, we may fall upon him, and overwhelm him with our numbers, as the dew falleth upon the ground. This laſt advice being more agreeable to Abſalom and all the elders of Iſrael, was preferred; upon which Ahitophel ſaddled his aſs, went to his houſe at Gillo, hanged himſelf, and was buried in the ſepulchre of his fathers. He foreſaw, without doubt, all that would happen in conſequence of Huſhai's advice, and was determined to prevent the death which he had deſerved, and which David would probably have inflicted on him, as ſoon as he ſhould be reſettled on his throne.

AHMELLA, in botany. See BIDENS.

AHOLIBAH and AHOLAH, are two feigned names made uſe of by Ezekiel (xxiii. 4.) to denote the two kingdoms of Judah and Samaria. Aholah and Aholibah are repreſented as two ſiſters of Egyptian extraction. Aholah ſtands for Samaria, and Aholibah for Jeruſalem. The firſt ſigifies a *tent*; and the ſecond, *my tent is in her*. They both proſtituted themſelves to the Egyptians and Aſſyrians, in imitating their abominations and idolatries: for which reaſon they were abandoned to thoſe very people for whom they had ſhown ſo paſſionate and ſo impure an affection; they were carried into captivity, and reduced to the ſevereſt ſervitude.

AHOUAI, in botany, a ſynonime and alſo the trivial name of a ſpecies of CERBERA.

A-HULL, in the ſea-language, the ſituation of a ſhip when all her ſails are furled on account of the violence of the ſtorm, and when having laſhed her helm on the lee-ſide, ſhe lies nearly with her ſide to the wind and ſea, her head being ſomewhat inclined to the direction of the wind.

AHUN, a town in France, in the Upper Marche and generality of Moulins, and is a royal juriſdiction. It is ſeated on the river Creuſe, near a Benedictine abbey of the ſame name, eight miles ſouth-eaſt of Gueret, 30 north-eaſt of Lomages, and 55 ſouth-eaſt of Moulins. E. Long. 2. 8. N. Lat. 49. 5.

AHUYS, a town of Sweden. It is ſmall, but very ſtrong by its ſituation, and has a good port. It is in the principality of Gothland, in the territory of Bleckingy, near the Baltic ſea, about 18 miles from Chriſtianſtadt. E. Long. 14. 10. N. Lat. 56. 20.

AI, (anc. geog.) a town in Judea, to the north of Jericho, called Αινα by Joſephus, and the inhabitants *Ainatæ*. Joſhua having ſent a detachment of 3000 men againſt Ai, God permitted them to be repulſed on account of Achan's ſin, who had violated the anathema pronounced againſt the city of Jericho. But after the expiation of this offence, God commanded Joſhua (chap. viii.) to march with the whole army of the Iſraelites againſt Ai, and treat that city and the kingdom thereof as he had treated Jericho, with this difference, that he gave the plunder of the town to the people. Joſhua ſent by night 30,000 men to lie in ambuſh behind Ai; having firſt well inſtructed thoſe who had the command of them in what they were to do; and the next day, early in the morning he marched againſt the city with the remainder of his army. The king of Ai perceiving them, ſallied haſtily out of the town with all his people, and fell upon the forces of the Iſraelites; who upon the firſt onſet fled, as if they had been under ſome great terror.

As ſoon as Joſhua ſaw the enemy all out of the gates, he raiſed his ſhield upon the top of a pike, which was the ſignal given to the ambuſcade; whereupon they immediately entered the place, which they found without defence, and ſet fire to it. The people of Ai perceiving the ſmoke aſcending, were willing to return, but diſcovered thoſe who had ſet fire to the city in their rear, while Joſhua and thoſe who were with him turning about, fell upon them, and cut them in pieces. The king was taken alive, and afterwards put to death.

The chevalier Folard obſerves, that Joſhua's enterpriſe on Ai, excepting in ſome particulars of military art, is very like that of Gibeah, which is ſcarce any thing more than a copy of it. It would appear, ſays that writer, by the ſcripture account, that Joſhua was not the author of the ſtratagem made uſe of by him: for when God directs himſelf to Joſhua, he ſays, 'Go 'up againſt Ai; lay an ambuſcade behind the town; I 'have delivered the king and the people of it into thine 'hands:' yet notwithſtanding this, God might leave the whole glory of the invention and execution of it to him, as to a great general. 'Joſhua aroſe,' ſays the ſacred author, 'and all the people of war, to go up a'gainſt Ai (verſe 3.); and Joſhua choſe out 30,000 'mighty men of valour and ſent them away by night.' Folard remarks, that there is a manifeſt contradiction between this verſe and the 12th, wherein it is ſaid, that Joſhua choſe out 500 men, whom he ſent to lie in ambuſh, between Bethel and Ai. How is this to be reconciled? Calmet ſays, that Maſius allows but 5000 men for the ambuſcade, and 25,000 for the attack of the city, being perſuaded that an army of 600,000 men could only create confuſion on this occaſion, without any neceſſity for, or advantage in, ſuch numbers: but the generality of interpreters, continues Calmet, acknowledge two bodies to be placed in ambuſcade, both between Bethel and Ai; one of 25,000, and the other of 5000 men.

With regard to the ſignal Joſhua made to that part of his army which lay in ambuſcade, the learned Folard embraces the opinion of the Rabbins, who believe what is called the ſhield to be too ſmall to ſerve for a ſignal: hence they make it to be the ſtaff of one of their colours: from this, our author concludes, that the whole colours were uſed on the occaſion; for in the Aſiatic ſtyle, which is very near the poetic, the part is oftentimes to be taken for the whole.

AJALON, (anc. geog.) a town of the tribe of Dan, one of the Levitical. Another in the tribe of Benjamin, in whoſe valley Joſhua commanded the moon to ſtand ſtill, being then in her decreaſe, and conſequently to be ſeen at the ſame time with the ſun.

AJAN, a coaſt and country of Africa, has the river Quilmanci on the ſouth; the mountains from which that river ſprings, on the weſt; Abyſſinia, or Ethiopia, and the ſtraight of Babelmandel, on the north; and the eaſtern, or Indian ocean, on the eaſt. The coaſt abounds with all neceſſaries of life, and has plenty of very good horſes. The kings of Ajan are often at war with the emperor of the Abyſſines; and all the priſoners they take they ſell to the merchants of Cambaya, thoſe of Aden, and other Arabs, who come to trade in their harbours, and give them in exchange, coloured cloths, glaſs-beads, raiſins, and dates; for which they alſo take back, beſides ſlaves, gold and ivory. The whole ſea-coaſt, from Zanguebar to the ſtraight of Babelmandel, is called the coaſt of Ajan; and a conſiderable part of it is ſtyled the Deſart-coaſt.

AJAX, the ſon of Oileus, was one of the principal generals that went to the ſiege of Troy: he raviſhed Caſſandra the daughter of Priam, even in the temple of Minerva, where ſhe thought to have taken ſanctuary. It is ſaid, he made a ſerpent of fifteen feet long ſo familiar with him, that it eat at his table, and followed him like a dog. The Locrians had a ſingular veneration for his memory.

Ajax, the ſon of Telamon, was, next to Achilles, the moſt valiant general among the Greeks at the ſiege of Troy: he commanded the troops of Salamis, and performed many great actions, of which we have an account in the Iliad, in *Dictys Cretenſis*, and in the 23d book of Ovid's Metamorphoſes. He was ſo enraged that the arms of Achilles were adjudged to Ulyſſes, that he immediately became mad. The Greeks paid great honours to him after his death, and erected a magnificent monument to his memory upon the promontory of Rhetium.

Ajax, in antiquity, a furious kind of dance, in uſe among the Grecians; intended to repreſent the madneſs of that hero after his defeat by Ulyſſes, to whom the Greeks had given the preference in his conteſt for Achilles's arms. Lucian, in his treatiſe of Dancing, ſpeaks of dancing the *Ajax*.—There was alſo an annual feaſt called *Ajantia*, Αιαντεια, conſecrated to that prince and obſerved with great ſolemnity in the iſland of Salamis, as well as in Attica; where, in memory of the valour of Ajax, a bier was expoſed, ſet out with a complete ſet of armour.

AJAZZO, a ſea-port town of the iſland of Corſica, in the Mediterranean, with a biſhop's ſee. Long. 26. 35. Lat. 41. 40.

Ajazzo, a ſea-port of town of Natolia, in the province of Caramania, anciently Sileſia, ſeated on the coaſt of the Mediterranean, 30 miles north of Antioch and 50 weſt of Aleppo, where the city of Iſſus anciently ſtood, and near which Alexander fought his ſecond battle with Darius. Long. 33. 10. Lat. 37. 0.

AICHSTAT, a town of Germany, in Franconia, and capital of a biſhoprick of the ſame name. It is remarkable for a curious piece of workmanſhip, called the ſun of the Holy Sacrament, which is the church: it is of maſſy gold, of great weight, and is enriched with 350 diamonds, 1400 pearls, 250 rubies, and other precious ſtones. This place is moderately large, and ſeated in a valley on the river Altmul, 10 miles N. of Newburgh, and 37 S. of Nuremberg. E. Lon. 11. 10. N. Lat. 49. 0. The biſhopric is 45 miles in length and 17 in breadth; and the biſhop is chancellor of the church of Mayence or Mentz.

AICUROUS, a ſpecies of parrot. See Psittacus.

AID, in a general ſenſe, denotes any kind of aſſiſtance given by one perſon to another.

Aid, in law, denotes a petition made in court to call in help from another perſon who has intereſt in land, or any other thing conteſted.

Aid-de-camp, in military affairs, an officer employed to receive and carry the orders of the general.

Aid-Auxilium, in ancient cuſtoms, a ſubſidy paid by vaſſals to their lords on certain occaſions. Such were the aid of relief, paid upon the death of the Lord Meſne to his heir; the *aid-cheval*, or capital aid, due to the chief lord on ſeveral occaſions, as, to make his eldeſt ſon a knight, to make up a portion for marrying his daughter, &c.

AIDS, in the French cuſtoms, certain duties paid on all goods exported or imported into that kingdom.

Court of Aids, in France, a ſovereign court eſtabliſhed in ſeveral cities, which has cognizance of all cauſes relating to the taxes, gabelles, and aids impoſed on ſeveral ſorts of commodities, eſpecially wine.

Aids, in the manege, are the ſame with what ſome writers call *cheriſhings*, and uſed to avoid the neceſſity of corrections.—The inner heel, inner leg, inner rein, &c. are called *inner aids*; as the outer heel, outer leg, outer rein, &c. are called *outer aids*.

AIDAN, a famous Scottiſh biſhop of Lindisferne, or Holy Iſland, in the 7th century, was employed by Oſwald king of Northumberland in the converſion of the Engliſh, in which he was very ſucceſsful. He died in 651.

AIGHENDALE, the name of a liquid meaſure uſed in Lancaſhire, containing ſeven quarts.

AIGLE, a bailiwick in the territory of Romand in Swiſſerland, conſiſts of mountains and vallies, the principal of which are the Aigle and Bex. Through theſe is the great road from Vallais into Italy. When you paſs by Villeneuve, which is at the head of the lake of Geneva, you enter into a deep valley three miles wide, bordered on one ſide with the Alps of Swiſſerland, and on the other with thoſe of Savoy, and croſſed by the river Rhone. Six miles from thence you meet with Aigle, a large town, ſeated on a wide part of the valley, where there are vineyards, fields, and meadows. The governor's caſtle is on an eminence that overlooks the town, and has a lofty marble tower. This government has nine large pariſhes; and is divided into four parts, Aigle, Bex, Olon, and Ormont. This laſt is among the mountains, and joins to Rougement. It is a double valley, abounding in paſture lands. Ivorna, in the diſtrict of Aigle, was in part buried by the fall of a mountain, occaſioned by an earthquake in 1584.

Aigle, a ſmall town in France, in Upper Normandy, twenty-three miles from D'Evereux, and thirty-eight from Rouen. It is ſurrounded with walls and ditches, has ſix gates, three ſuburbs, and three pariſhes. It trades in corn, toys, and more particularly in needles and pins. E. Long. 1. 5. N. Lat. 48. 35.

AIGUILLON, a ſmall town of France in the province of Guienne, ſituated at the conflux of the rivers Garonne and Lot.

AIGUISCE, in heraldry, denotes a croſs with its four ends ſharpened, but ſo as to terminate in obtuſe angles.—It differs from the croſs fitchee, in as much as the latter tapers by degrees to a point, and the former only at the ends.

AILANA, AILATH, or AHELOTH, anciently a town of Arabia Petræa, ſituated near the Sinus Elanites of the Red Sea. It was alſo called *Elath*, and *Eloth*, (Stephanus, Strabo, Moſes.) The ſame with *Elana*.

AILE, in law, a writ which lies where a perſon's grandfather, or great-grandfather, being ſeiſed of lands, &c. in fee-ſimple, the day that he died, and a ſtranger abates and enters the ſame day, and diſpoſſeſſes the heir of his inheritance.

AILESBURY, AYLESBURY or ALESBURY, a borough town in Buckinghamſhire, conſiſting of about 400 houſes. It conſiſts of ſeveral ſtreets, though the houſes are not very contiguous: theſe lie round about the market-place, in the middle of which is a convenient hall, where the ſeſſions are held, and ſometimes the aſſizes for the county. It ſends two members to Parliament; has a market on Saturdays; and three fairs for cattle, viz. on the Saturday before Palm-Sunday, June 14th, and September 25th. It is ſixty miles ſouth-eaſt of Buckingham, and forty-four north-weſt of London. W. Long. 0. 40. N. Lat. 51. 40.

AILMER, or ÆTHELMARE, Earl of Cornwall and Devonſhire, in the reign of king Edgar. It is not known of what family he was. His authority and riches were great, and ſo alſo in appearance was his piety. He founded the abbey of Cerne, in Dorſetſhire; and had ſo great a veneration for Eadwald, the brother of St Edmund the martyr, who had lived a hermit in that country, near the ſilver well, as they called it, that, with the aſſiſtance of Archbiſhop Dunſtan, he tranſlated his relics to the old church of Cernel. In 1016, when Canute, the ſon of Suane, invaded England, and found himſelf ſtoutly oppoſed by that valiant Saxon prince Edmund Ironſide, the ſon of Æthelred, this Earl Ailmer, with that arch traitor Eadric Streone, Earl of Mercia, and Earl Algar, joined the Dane againſt their natural prince, which was one great cauſe of the Saxon's ruin. He did not long ſurvive this; and we find mentioned in hiſtory only one ſon of his, whoſe name was Æthelward, Earl of Cornwall, who followed his father's maxims, and was properly rewarded for it. For in 1018, Canute reaping the benefit of their treaſons, and perceiving that the traitors were no longer uſeful, he cauſed the infamous Eadric Streone, and this Earl Æthelward, to be both put to death.

AILRED, or EALRED, abbot of Reveſby in Lincolnſhire, in the reigns of Stephen and Henry II. He was born in 1109, of a noble family, and educated in Scotland with Henry the ſon of king David. On his return to England, he became a monk of the Ciſtertian order, in the monaſtery of Reveſby, of which he afterwards was made Abbot. He died on the 12th of January 1166, aged 57, and was buried in his monaſtery. "He was (ſays Leland) in great eſteem during his life; celebrated for the miracles wrought after his death; and admitted into the catalogue of ſaints." He was author of ſeveral works; moſt of which were publiſhed by Gilbo the Jeſuit at Douay, 1631; part of them may be alſo found in the *Bibliotheca Ciſtercienſis*, and *Bibliotheca Patrum*. His principal work is the *Speculum charitatis*. Leland, Bale, and Pits, mention ſeveral manuſcripts which never were publiſhed.

AILSA, an inſulated rock on the weſtern coaſt of Scotland, between the ſhores of Airſhire and Cantire. It is two miles in circumference at the baſe, is acceſſible only in one place, and riſes to a great height in a pyramidical form. A few goats and rabbits pick up a ſubſiſtence among the ſhort graſs and furze; but the importance of the rock conſiſts in the great variety and boundleſs numbers of birds, by which it is frequented, particularly the gannets or ſolan-geeſe, whoſe young are uſed at the beſt tables, and bring a good price. Other birds are caught for their feathers. The rock is rented from the Earl of Caſſilis at L. 33 *per annum*. The depth of water around the baſe is from 7 to 48 fathoms. It is ſurrounded with excellent banks, well ſtocked with cod and other white fiſh.

AINSWORTH (Dr Henry), an eminent nonconformiſt divine, who, about the year 1590, diſtinguiſhed himſelf among the Browniſts; which drew upon him ſuch troubles that he was obliged to retire to Holland, and became miniſter of a church at Amſterdam. His ſkill in the Hebrew language, and his excellent Annotations on the Holy Scriptures, which are ſtill highly eſteemed, gained him great reputation. He alſo wrote ſeveral pieces in defence of the Browniſts, and ſeveral other works.

AINSWORTH (Robert), born at Woodyale in Lancaſhire in 1660, was maſter of a boarding-ſchool at Bethnal-green, from whence he removed to Hackney, and to other places in the neighbourhood of London. After acquiring a moderate fortune, he retired, and lived privately till the time of his death, which happened in 1743. We are indebted to him for the beſt Latin and Engliſh Dictionary extant: he publiſhed it in quarto 1736; and in 1752, the fourth edition, under the care of Doctor Ward of Greſham College, and the Rev. William Younge, was enlarged to two vols. folio.

AIR, in natural philoſophy, a thin, fluid, elaſtic, tranſparent, ponderous, compreſſible, and dilatable body, ſurrounding the terraqueous globe to a conſiderable height. See AEROLOGY, ATMOSPHERE, and PNEUMATICS.

Impregnation of Water with Fixed AIR, *and with Sulphureous* AIR. See MINERAL *Waters*.

AIR, in Medicine, &c. makes one of the ſix non-naturals.—From obſervations on bleeding in rheumatiſms, and after taking cold, it is evident, the air can enter with all its qualities, and vitiate the whole texture of the blood, and other juices.—From the palſies, vertigoes, and other nervous affections cauſed by damps, mines, &c. it is evident, that air thus qualified can relax and obſtruct the whole nervous ſyſtem. And from the colics, fluxes, coughs, and conſumptions produced by damp, moiſt, and nitrous air, it is evident it can corrupt and ſpoil the noble organs, &c.

Circulation of AIR *in Rooms.* To render the circulation of air ſenſible, let the air of a room be heated by a ſtrong fire, while the air of a contiguous room is cold; then let the door between theſe two rooms be opened, in which caſe the hot air of one room being lighter, will paſs through the upper part of the opening of the door into the cold room; and, on the contrary, the cold air of the other room being heavier, will paſs into the former room through the lower part of the opening; accordingly, it will be found, that applying a lighted candle at the top, in the middle, and at the lower part of the opening between the two rooms, a ſtrong current of air will appear to paſs from the hot into the cold room near the top; a contrary current of air will appear to paſs from the latter into the former room near the lower part of the ſaid opening; whilſt in the middle there is little or no motion at all, as may be clearly perceived by the direction of the flame of the candle.

It is for the ſame reaſon that when the fire is lighted in a chimney, a ſtrong current of air is occaſioned to enter the room, which may be felt by applying the hand near the key-hole, or other ſuch ſmall openings, if the doors and windows are ſhut; for the air over the fire being heated, becomes lighter, and aſcends into the chimney, conſequently other colder air muſt ſupply its place, which forces its way through all the ſmall openings it can find. Were a room with a fire in it to be perfectly cloſed, excepting the chimney, the air in it would ſoon become unwholeſome for reſpiration, and the fire would be ſoon extinguiſhed, beſides other inconveniences. Hence it appears, that thoſe perſons miſtake who expect to keep the air of a room ſweet and wholeſome, eſpecially for convaleſcents, by accurately ſtopping all the ſmalleſt openings that admit freſh air. When the current of air that enters into a room is on ſome ſide of it where it falls immediately upon the perſons who ſit in the room, then it may be offenſive, eſpecially to delicate conſtitutions. In that caſe, ſuch opening ſhould be cloſed: but at the ſame time another opening ſhould be made for admitting freſh air, in another more convenient part; for a circulation of air, eſpecially in rooms where a fire is kept, is not only ſalutary and uſeful, but is abſolutely neceſſary.

In an ingenious publication, intitled, *A Practical Treatiſe on Chimneys*, there are the following remarks relating to the propereſt method of admitting air into a room, and of expelling the contaminated air. The author, directing to make a vent-hole near the top of the room, in order to expel the heated and contaminated air, "this," ſays he "might be done by means of a ſmall tube opening into the room, either in or near the ceiling; which might either be carried to the top of the building, or be made to communicate with the external air by a ſmall perforation through the wall at the roof of the room; by means of either of which, a proper circulation would be eſtabliſhed, and the foul air be carried off.

"For the fire would no ſooner have warmed any particles of air within the room, than theſe would be greatly expanded, and riſe immediately upwards, ſo as to fill the higher parts of the room with rarefied air; and as other particles would be ſucceſſively heated and rarefied in their turn, by their expanſive force they would preſs upon the ſides of the apartment in every place, ſo as to force the lighteſt particles through the opening left for that purpoſe in the top of the room; by which means the fouleſt air would be gradually drawn off, without deſcending again into the lower regions to the annoyance of the company."

But in order to admit freſh air into the room, "Let," ſays he, "another opening be made in the ceiling of the room, having a communication with a ſmall pipe that ſhould lead from thence either to the outſide of the wall, or to any other part of the building that might be judged more convenient, where it ſhould be bent, and conducted downwards, till it reached the ground; where it ſhould be left open, to communicate with the external air.—In this ſituation the cool external air would be forced in at the lower opening of the tube, and made to aſcend into the apartment in proportion to the quantity that eſcaped towards the higher regions by means of the ventilator. And as that weighty air would no ſooner enter the room, than it would tend towards the floor by its own natural gravity, it would gradually mix with the heated air in its deſcent—become, in ſome meaſure, warmed by that means, and equally diſperſed through the room, ſo as ſlowly and imperceptibly to reach the candles and the company in the room, and ſupply them with a ſufficient quantity of freſh and wholeſome air, without the inconveniences to which the company are ſubjected by the uſual way of admitting freſh air (A). For if it enters near the floor of the apartment, it is hurried along in a rapid undivided ſtream towards the fire-place, and ſtriking upon the legs and inferior parts of the body, affects them with a ſtrong ſenſation of cold. To overcome the effects of this, large fires muſt be kept; by which other parts of the body are warmed to an extraordinary degree, which is productive of moſt of thoſe diſorders that are pernicious to the young, and often prove fatal to the old, during the winter-ſeaſon, in theſe cold regions.

"Thus might our apartments be kept conſtantly, and moderately, and equally warm, at a moderate expence, without endangering our health on the one hand, by reſpiring a confined, ſtagnant, and putrid air, or, on the other hand, by ſubjecting ourſelves to ſuch danger of catching colds, conſumptions, and rheumatic complaints, by being expoſed to ſuch exceedingly unequal

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(A) Such readers as have been little accuſtomed to ſpeculations of this ſort, will be at a loſs to comprehend in what manner two holes, both of them in the roof of the room, and communicating with the air, without any valve, or other contrivance, for opening or cloſing of themſelves, ſhould yet anſwer the two very oppoſite purpoſes; one, of conſtantly bringing cool air into the room without emitting any warm air—and the other, of as conſtantly emitting warm and admitting no cool air. They will pleaſe to advert, that the one of theſe tubes communicates with the atmoſphere at the bottom of the houſe, and the other towards the top: the opening of the one is beneath the level of the room, that of the other above it. Now, as the air is more denſe at the ſurface of the ground than at any height above it, the warm rarefying air will naturally iſſue at that opening where it meets with leaſt reſiſtance, which muſt invariably be through that which opens to the external air at the greateſt height; and as the cool air will naturally be preſſed into the room by that opening where the air is moſt weighty, this muſt invariably be by that which is neareſt the ſurface of the earth.

equal degrees of heat and cold, as are unavoidable where our apartments are ſo open as to admit a ready paſſage to the external air during the winter-ſeaſon.

" The reader will eaſily perceive, that all that has been here ſaid has a reference only to thoſe apartments in cold climates, and rigorous weather, where fire to warm them becomes neceſſary. In warmer regions, or during the ſummer-ſeaſon, there can be no objection to the wheel-ventilator in the window.—It is a ſimple contrivance, and a ſafe and effectual mean of preſerving the air in our apartments ſweet and wholeſome at that ſeaſon."

It is a vulgar error among many people, to believe that fire purifies the contaminated air, by deſtroying the noxious particles mixed with it; and for this reaſon they think, that the fire kept in a room where the air is tainted, purifies the room, by rendering the air in it again fit for reſpiration. Indeed, a fire kept in a room or apartment, where the air is tainted, as is the caſe with hoſpitals, goals, and the like, does certainly purify the apartment, and the practice is very uſeful; but this effect is only becauſe the fire promotes the circulation of the air, and dries the dampneſs of rooms, furniture, &c.; ſo that it is not the infected air that is purified, but is new, freſh, and wholeſome air, that by the action of the fire has taken the place of the infected air; which infected air, being rarefied by the heat, has been expelled from the apartment. Fire and combuſtion in general is ſo far from purifying contaminated air, that it actually contaminates a prodigious quantity of it in a ſhort time; ſo that not only a common fire, but even a lighted candle, when kept in a well-cloſed room, wherein the external air has not a free acceſs, inſtead of purifying, renders the air of that room noxious.

Inſtrument for aſcertaining the Purity or Wholeſomeneſs of reſpirable AIR. See EUDIOMETER.

AIR BALLOONS, a general name given to bags of any light ſubſtance filled with inflammable air, or other permanently elaſtic fluid, whoſe ſpecific gravity is conſiderably leſs than that of common atmoſpheric air. The conſequence of their being filled in this manner is, that if they are of any conſiderable magnitude, they aſcend in the air to an amazing height; and will not only aſcend in this manner by themſelves, but carry up along with them great weights, and continue to riſe till they attain an height in which the circumambient air is of the ſame ſpecific gravity with themſelves. In this ſituation they will either float or be driven in the direction of the wind or current of air in which they are expoſed, remaining in theſe elevated regions till the fluid eſcapes by the burſting of the bags from the ſuperior elaſticity of the fluid, or by its gradual evaporation through the pores of the envelope. The hiſtory, principles, &c. of thoſe machines are detailed under the article AEROSTATION.

AIR-Bladder, in fiſhes. See COMPARATIVE ANATOMY, chap. iii. and ICHTHYOLOGY.

Plate X.

AIR-Gun, a pneumatic machine for exploding bullets, &c. with great violence.

The common air-gun is made of braſs, and has two barrels: the inſide barrel A, fig. 8, which is of a ſmall bore, from whence the bullets are exploded; and a large barrel ECDR on the outſide of it. There is a ſyringe SMNP fixed in the ſtock of the gun, by which the air is injected into the cavity between the two barrels through the valve EP. The ball K is put down into its place in the ſmall barrel, with the rammer, as in any other gun. At SL is another valve, which, being opened by the trigger O, permits the air to come behind the bullet, ſo as to drive it out with great force. If this valve be opened and ſhut ſuddenly, one charge of condenſed air may be ſufficient for ſeveral diſcharges of bullets; but if the whole air be diſcharged on one ſingle bullet, it will drive it out with a great force. This diſcharge is effected by means of a lock, fig. 9, placed here as uſual in other guns; for the trigger being pulled, the cock will go down and drive the lever O, fig. 8, which will open the valve, and let in the air upon the bullet K.

Air-guns have of late years received very great improvements in their conſtruction. Fig. 10. is a repreſentation of one made by the late Mr B. Martin of London, and now by ſeveral of the mathematical inſtrument and gun makers of that metropolis. For ſimplicity and perfection it exceeds any other heretofore contrived. A is the gun-barrel, with the lock, ſtock, ram-rod, and of the ſize and weight of a common fowling-piece. Under the lock, at *b*, is a round ſteel tube, having a ſmall moveable pin in the inſide, which is puſhed out when the trigger *a* is pulled, by the ſpring-work within the lock; to this tube *b*, a hollow copper-ball *c* ſcrews, perfectly air-tight. This copper ball is fully charged with condenſed air by the ſyringe B (fig. 7.) previous to its being applied to the tube *b* of fig. 10. It is then evident, that if a bullet be rammed down in the barrel, the copper ball ſcrewed faſt at *b*, and the trigger *a* be pulled, that the pin in *b* will, by the action of the ſpring-work within the lock, forcibly ſtrike out into the copper ball; and thereby puſhing in ſuddenly a *valve* within the copper ball, let out a portion of the condenſed air; which air will ruſh up thro' the aperture of the lock, and forcibly act againſt the bullet, driving it to the diſtance of 60 or 70 yards or further. If the air is ſtrongly condenſed at every diſcharge, only a portion of the air eſcapes from the ball; therefore, by re-cocking the piece, another diſcharge may be made; and this repeated to the amount of 15 or 16 times. An additional barrel is ſometimes made, and applied for the diſcharge of ſhot, inſtead of the one above deſcribed.

The air in the copper ball is condenſed by means of the ſyringe B (fig. 7.) in the following manner: The ball *c* is ſcrewed quite cloſe on the top of the ſyringe at *b*, at the end of the ſteel pointed rod: *a* is a ſtout ring through which paſſes the rod *k*: upon this rod the feet ſhould be firmly ſet; then the hands are to be applied to the two handles *ii*, fixed on the ſide of the barrel of the ſyringe. Now, by moving the barrel B ſteadily up and down on the rod *a*, the ball *c* will become charged with condenſed air; and it may be eaſily known when the ball is as full as poſſible, by the irreſiſtible action that the air makes againſt the piſton when you are working the ſyringe. At the end of the rod *k* is uſually a four-ſquare hole, which with the rod ſerves as a key to faſten the ball *c* faſt on the ſcrew *b* of the gun and ſyringe cloſe to the orifice in the ball *c*. In the inſide is fixed a valve and ſpring, which gives way for the admiſſion of air; but upon its condition comes cloſe up to the orifice, ſhutting up the internal air. The piſton-rod works air-tight, by a collar of leather on it, in the barrel B; it is therefore plain, when the barrel is drawn up, the air will ruſh in at the hole *h*. When the barrel is puſhed down, the air therein contained will have no other way to paſs from the preſſure of the piſton but into the ball *c* at top. The barrel being drawn up, the operation is repeated, until the condenſation is ſo ſtrong, as to reſiſt the action of the piſton.

Sometimes the ſyringe is applied to the end of the barrel C (ſee fig. 11.); the lock and trigger ſhut up in a braſs caſe *d*; and the trigger pulled, or diſcharge made, by pulling the chain *b*. In this contrivance there is a round chamber for the condenſed air at the end of the ſyringe at *e*, and it has a valve acting in a ſimilar manner to that of the copper ball. When this inſtrument is not in uſe, the braſs caſe *d* is made to ſlide off, and the inſtrument then becomes a walking-ſtick: from which circumſtance, and the barrel being made of cane, braſs, &c. it has received the appellation of the *Air-cane*. The head of the cane unſcrews and takes off at *a*, where the extremity of the piſton-rod in the barrel is ſhown: an iron rod is placed in a ring at the end of this, and the air condenſed in the barrel in a ſimilar manner to that of the gun as above; but its force of action is not near ſo ſtrong and permanent as that of the latter.

The *Magazine Air-Gun* was invented by that ingenious artiſt L. Colbe. By this contrivance ten bullets are ſo lodged in a cavity, near the place of diſcharge, that they may be drawn into the ſhooting-barrel, and ſucceſſively diſcharged ſo faſt, as to be nearly of the ſame uſe as ſo many different guns.

Fig. 12. repreſents the preſent form of this machine, where part of the ſtock is cut off, to the end of the injecting ſyringe. It has its valve opening into the cavity between the barrels, as before. KK is the ſmall ſhooting-barrel, which receives the bullets from the magazine ED, which is of a ſerpentine form, and cloſed at the end D when the bullets are lodged in it. The circular part *abc*, is the key of a cock, having a cylindric hole through it, *ik*, which is equal to the bore of the ſame barrel, and makes a part of it in the preſent ſituation. When the lock is taken off, the ſeveral parts Q, R, T, W, &c. come into view, by which means the diſcharge is made by puſhing up the pin P*p*, which raiſes and opens a valve V, to let in the air againſt the bullet I, from the cavity FF: which valve is immediately ſhut down again by means of a long ſpring of braſs NN. This valve V being a conical piece of braſs, ground very true in the part which receives it, will of itſelf be ſufficient to confine the air.

To make a diſcharge, you will pull the trigger ZZ, which throws up the ſeer *ya*, and diſengages it from the notch *a*, upon which the ſtrong ſpring WW moves the tumbler T, to which the cock is fixed. This, by its end *u*, bears down the end *v* of the tumbling lever R, which, by the other end *m*, raiſes at the ſame time the flat end of the horizontal lever Q; and by this means, of courſe, the pin P*p*, which ſtands upon it, is puſhed up, and thus opens the valve V, and diſcharges the bullet. This is all evident from a bare view of the figure.

To bring another bullet to ſucceed that marked I, inſtantaneouſly, turn the cylindric cavity of the key of the cock, which before made part of the barrel KK, into the ſituation *ik*, ſo that the part *i* may be at K; and hold the gun upon your ſhoulder, with the barrel downwards and the magazine upwards, by which means that bullet next the cock will fall into it out of the magazine, but go no farther into this cylindric cavity than the two little ſprings *ss*, which detain it. The two circles repreſent the cock-barrel, wherein the key abovementioned turns upon an axis not repreſented here, but viſible in fig. 13. This axis is a ſquare piece of ſteel, on which comes the ſquare hole of the hammer H, fig. 14.; by which the cylindric cavity mentioned is opened to the magazine. Then opening the hammer, as in that figure, the bullet is brought into its proper place near the diſcharge-valve, and the cylindric cavity of the key of the cock again makes part of the inward barrel KK.

It evidently appears how expeditious a method this is of charging and diſcharging a gun; and were the force of condenſed air equal to that of gun-powder, ſuch an air-gun would anſwer the end of ſeveral guns.

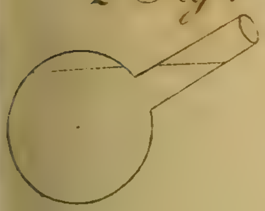
In the air-gun, and all other caſes where the air is required to be condenſed to a very great degree, it will be requiſite to have the ſyringe of a ſmall bore, viz. not exceeding half an inch in diameter; becauſe the preſſure againſt every ſquare inch is about 15 pounds, and therefore againſt every circular inch about 12 pounds. If therefore the ſyringe be one inch in diameter, when one atmoſphere is injected, there will be a reſiſtance of 12 pounds againſt the piſton; and when 10 are injected, there will be a force of 120 pounds to be overcome; whereas 10 atmoſpheres act againſt the circular half inch piſton (whoſe area is only one-fourth part ſo big) with only a force equal to 30 pounds; or 40 atmoſpheres may be injected with ſuch a ſyringe, as well as 10 with the other. In ſhort, the facility of working will be inverſely as the ſquares of the diame- of the ſyringe.

Air-Jacket, a ſort of jacket made of leather, in which are ſeveral bags, or bladders, compoſed of the ſame materials, communicating with each other. Theſe are filled with air through a leather tube, having a braſs ſtop-cock accurately ground at the extremity, by which means the air blown in through the tube is confined in the bladders. The jacket muſt be wet, before the air be blown into the bags, as otherwiſe it will immediately eſcape through the pores of the leather. By the help of theſe bladders, which are placed near the breaſt, the perſon is ſupported in the water, without making the efforts uſed in ſwimming.

Air-Pipes, an invention for drawing foul air out of ſhips, or any other cloſe places, by means of fire. Theſe pipes were firſt found out by one Mr Sutton, a brewer in London; and from him have got the name of *Sutton's-Air-pipes*. The principle on which their operation depends is known to every body, being indeed no other than that air is neceſſary for the ſupport of fire; and, if it has not acceſs from the places moſt adjacent, will not fail to come from thoſe that are more remote. Thus, in a common furnace, the air enters through the aſh-hole; but if this is cloſed up, and a hole made in the ſide of the furnace, the air will ruſh in with great violence through that hole. If a tube of any length whatever is inſerted in this hole, the air will ruſh through the tube into the fire, and of con-

Plate X

AEROLOGY


2d Fig 1

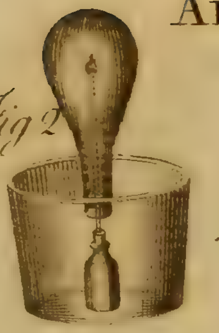


Fig 2

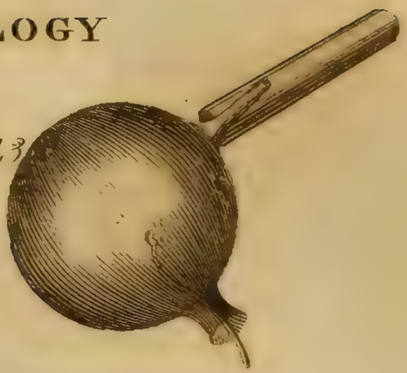


Fig 3

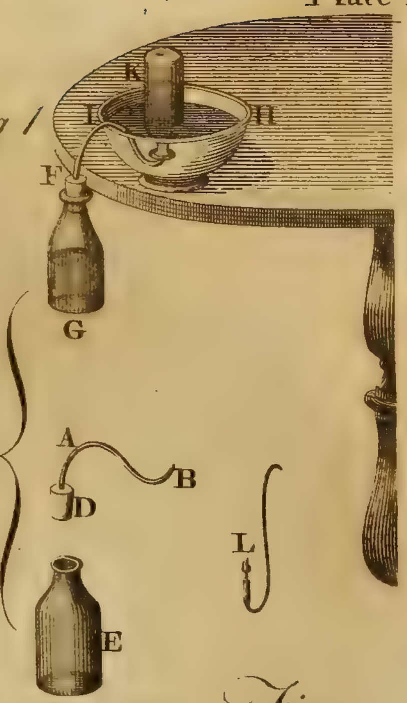


Fig 1

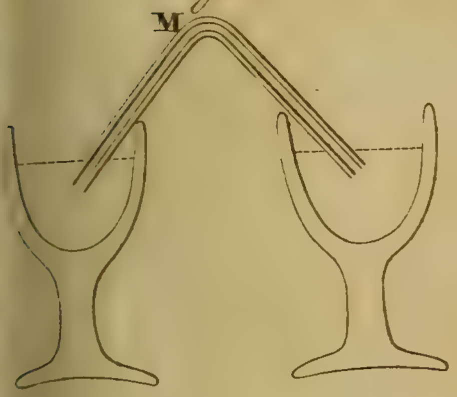
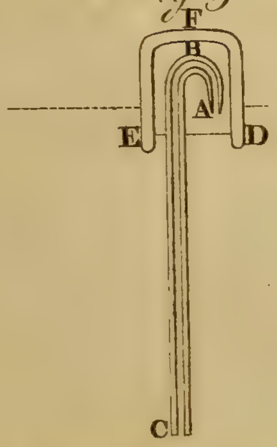


Fig 4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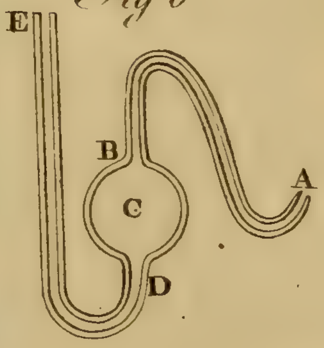
Fig 6

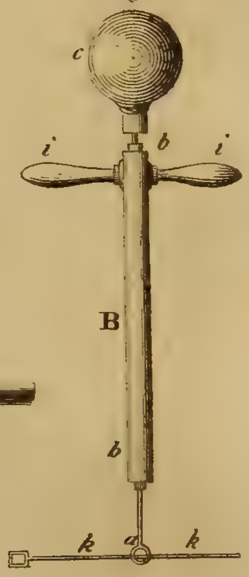
Fig 7

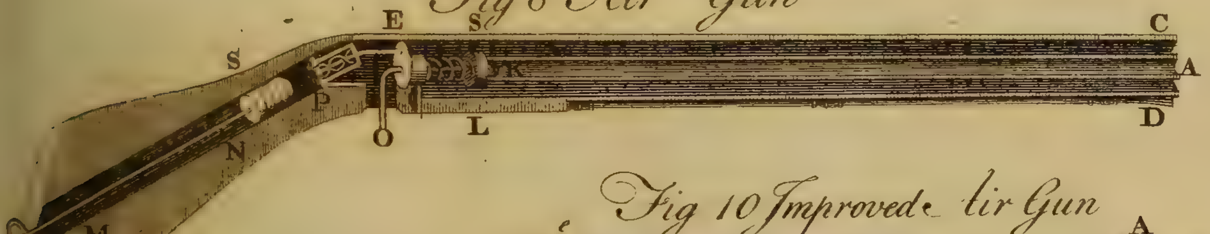
Fig 8 Air Gun

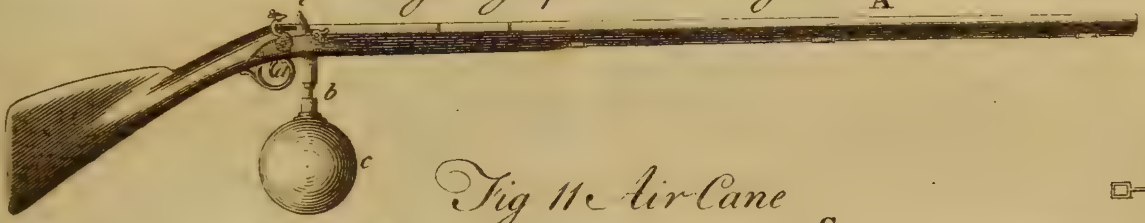
Fig 10 Improved Air Gun

Fig 9

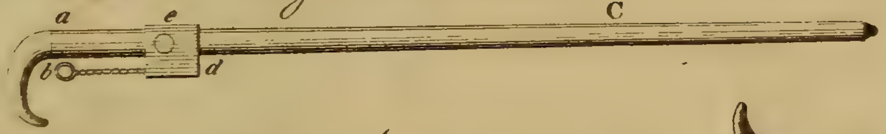
Fig 11 Air Cane

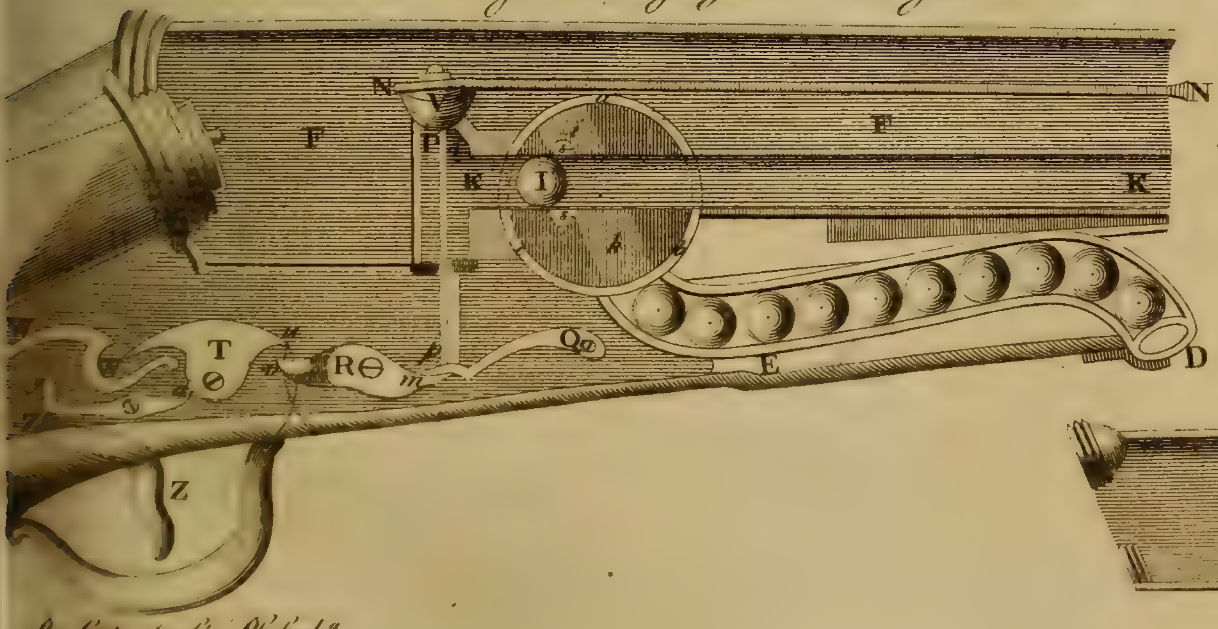
Fig 12 Magazine Air Gun

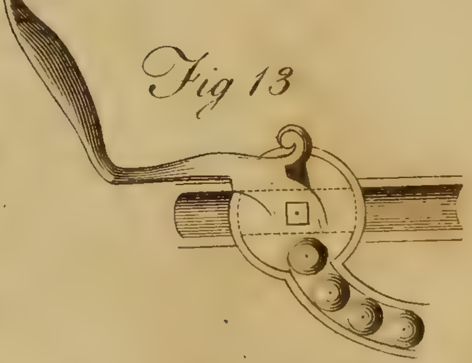
Fig 13

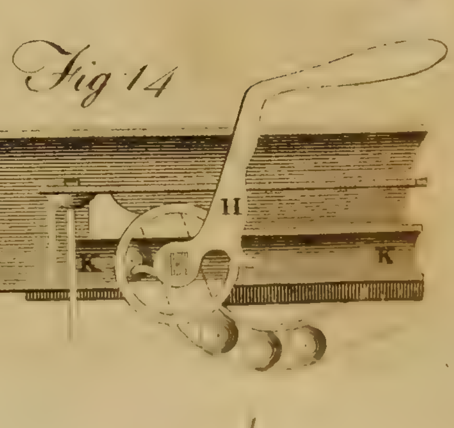
Fig 14

R. Scot Sculpt Philada

conſequence there will be a continued circulation of air in that place where the extremity of the tube is laid. Mr Sutton's contrivance then, as communicated to the Royal Society by Doctor Mead, amounts to no more than this.—"As, in every ſhip of any bulk, there is already provided a copper or boiling-place proportionable to the ſize of the veſſel; it is propoſed to clear the bad air, by means of the fire already uſed under the ſaid coppers or boiling-places for the neceſſary uſes of the ſhip.

"It is well known, that, under every ſuch copper or boiler, there are placed two holes, ſeparated by a grate; the firſt of which is for the fire, and the other for the aſhes falling from the ſame; and that there is alſo a flue from the fire-place upward, by which the ſmoke of the fire is diſcharged at ſome convenient place of the ſhip.

"It is alſo well known, that the fire once lighted in theſe fire-places, is only preſerved by the conſtant draught of air through the aforementioned two holes and flue; and that if the ſaid two holes are cloſely ſtopped up, the fire, though burning ever ſo briſkly before, is immediately put out.

"But if, after ſhutting up the abovementioned holes, another hole be opened, communicating with any other room or airy place, and with the fire; it is clear, the ſaid fire muſt again be raiſed and burn as before, there being a like draught of air through the ſame as there was before the ſtopping up of the firſt holes; this caſe differing only from the former in this, that the air feeding the fire will now be ſupplied from another place.

"It is therefore propoſed, that, in order to clear the holds of ſhips of the bad air therein contained, the two holes abovementioned, the fire-place and aſh-place, be both cloſed up with ſubſtantial and tight iron-doors; and that a copper or leaden pipe, of ſufficient ſize, be laid from the hold into the aſh-place, for the draught of air to come in that way to feed the fire. And thus it ſeems plain, from what has been already ſaid, that there will be, from the hold, a conſtant diſcharge of the air therein contained; and conſequently, that that air, ſo diſcharged, muſt be as conſtantly ſupplied by freſh air down the hatches or ſuch other communications as are opened into the hold; whereby the ſame muſt be continually freſhened, and its air rendered more wholeſome and fit for reſpiration.

"And if into this principal pipe ſo laid into the hold, other pipes are let in, communicating reſpectively, either with the well or lower decks; it muſt follow, that part of the air, conſumed in feeding the fire, muſt be reſpectively drawn out of all ſuch places to which the communication ſhall be ſo made."

This account is ſo plain, that no doubt can remain concerning the efficacy of the contrivance: it is evident, that, by means of pipes of this kind, a conſtant circulation of freſh air would be occaſioned thro' thoſe places where it would otherwiſe be moſt apt to ſtagnate and putrefy. Several other contrivances have been uſed for the ſame purpoſe; and Doctor Hales's ventilators, by ſome unaccountable prejudice, have been reckoned ſuperior in efficacy and even ſimplicity to Mr Sutton's machine, which at its firſt invention met with great oppoſition*, and even when introduced by Dr Mead, who uſed all his intereſt for that purpoſe, was ſhamefully neglected.

A machine capable of anſwering the ſame purpoſe was invented by Mr Deſaguliers, which he called the *ſhip's lungs*. It conſiſted of a cylindrical box ſet up on its edge, and fixed to a wooden pedeſtal. From the upper edge of the box iſſued a ſquare trunk open at the end, and communicating with the cavity of the box. Within this box was placed a cylindrical wheel turning on an axis. It was divided into 12 parts, by means of partitions placed like the radii of a circle. Theſe partitions did not extend quite to the centre, but left an open ſpace of about 18 inches diameter in the middle; towards the circumference, they extended as far as poſſible without interfering with the caſe, ſo that the wheel might always be allowed to turn freely.—Things being thus circumſtanced, it is plain, that if the wheel was turned towards that ſide of the box on which the trunk was, every diviſion would puſh the air before it, and drive it out through the trunk, at the ſame time that freſh air would come in through the open ſpace at the centre, to ſupply that which was thrown out thro' the trunk. By turning the wheel ſwiftly, a ſtrong blaſt of air would be continually forced out thro' the ſquare trunk, on the ſame principles on which a common fanner winnows corn. If the wheel is turned the oppoſite way, a draught of air may be produced from the trunk to the centre. If this machine, then, is placed in a room where a circulation of air is wanted, and the trunk made to paſs through one of the walls; by turning the wheel ſwiftly round, the air will be forced with great velocity out of that room, at the ſame time that freſh air will enter through any chinks by which it can have acceſs to ſupply that which has been forced out.

It is evident, that the circulation which is promoted by this machine, is entirely of the ſame kind with that produced by Mr Sutton's; the turning of the wheel in Mr Deſaguliers' machine being equivalent to the rarefaction of the air by fire in Mr Sutton's: but that the latter is vaſtly ſuperior, as acting of itſelf, and without intermiſſion, requires no arguments to prove. Mr Sutton's machine has yet another conveniency, of which no other contrivance for the ſame purpoſe can boaſt; namely, that it not only draws out putrid air, but deſtroys it by cauſing it paſs through fire; and experience has abundantly ſhown, that though putrid air is thrown into a great quantity of freſh air, it is ſo far from loſing its pernicious properties, that it often produces noxious diſeaſes. We do not ſay, indeed, that putrid air becomes ſalutary by this means; but it is undoubtedly rendered leſs noxious than before; tho' whether it is equally innocent with the ſmoke of a fire fed in the common way, we cannot pretend to determine.

Beſides this machine by Mr Deſaguliers, the ventilators of Dr Hales, already mentioned, and thoſe called *wind-ſails*, are likewiſe uſed for the ſame purpoſe. The former of which is an improvement of the Heſſian-bellows*: the other is a contrivance for throwing freſh air into thoſe places where putrid air is apt to lodge; but this has the laſt-mentioned inconvenience in a much greater degree than any of the others, as the blaſt of freſh air throws out that which was rendered putrid by ſtagnation, in ſuch a manner as to contaminate all around it. See WIND-*Sails*.

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* See *Sutton*.

* See *Ventilator*.

Air-Trunk, is alſo a contrivance by Doctor Hales to prevent the ſtagnation of putrid effluvia in jails, and other places where a great number of people are crowded together in a ſmall ſpace. It conſiſts only of a long ſquare trunk open at both ends; one of which is inſerted into the ceiling of the room, the air of which is required to be kept pure; and the other extends a good way beyond the roof. Through this trunk a continued circulation is carried on: and the reaſon is, that the putrid effluvia which do ſo much miſchief when collected, being much lighter than the pure atmoſphere, ariſe to the top of the room; and, if they there find a vent, will continually go out through it. Theſe effluvia ariſe in very conſiderable quantity, being calculated by the late Dr Keil at no leſs than 39 ounces from one man in 24 hours.

Theſe trunks were firſt made trial of by Mr Yeoman, over the Houſe of Commons, where they were nine inches wide within, and over the Court of King's-bench in Weſtminſter-hall, where they were ſix inches wide. They are ſometimes made wider, and ſometimes narrower: but the wider they are the longer they ought to be, more effectually to promote the aſcent of the vapour. The reaſon why vapours of this kind aſcend more ſwiftly through a long trunk than a ſhort one, is, that the preſſure of fluids is always according to their different depth, without regard to the diameter of their baſis, or of the veſſel which contains them; and, upon this principle, a gallon of water may be made to ſplit a ſtrong caſk. See Hydrostatics. When the column of putrid effluvia is long and narrow, the difference between the column of atmoſphere preſſing on the upper end of the trunk, and that which preſſes on the lower end, is much greater than if the column of putrid effluvia was ſhort and wide; and conſequently the aſcent is much ſwifter.—One pan of a ſingle pair of ſcales, which was two inches in diameter, being held within one of theſe trunks over the Houſe of Commons, the force of the aſcending air made it riſe ſo as to require four grains to reſtore the equilibrium, and this when there was no perſon in the houſe; but when it was full, no leſs than 12 grains were requiſite to reſtore the equilibrium; which clearly ſhows that theſe trunks muſt be of real and very great efficacy.

Air-Pump, a machine by which the air contained in a proper veſſel may be exhauſted or drawn out. See the article Penumatics.

Air-Sacs, in birds. See Comparative Anatomy, chap. ii.

Air-Shafts, among miners, denote holes or ſhafts let down from the open air to meet the adits and furniſh freſh air. The damps, want, and impurity of air which occur, when adits are wrought 30 or 40 fathoms long, make it neceſſary to let down air-ſhafts, in order to give the air liberty to play through the whole work, and thus diſcharge bad vapours, and furniſh good air for reſpiration: the expence of which ſhafts, in regard to their vaſt depths, hardneſs of the rock, drawing of water, &c. ſometimes equals, nay exceeds, the ordinary charge of the whole adit.

Sir Robert Murray deſcribes a method, uſed in the coal-mines at Leige, of working mines without air-ſhafts.

When the miners at Mendip have ſunk a groove, they will not be at the charge of an air-ſhaft till they come at ore; and for the ſupply of air have boxes of elm exactly cloſed, of about ſix inches in the clear, by which they carry it down about twenty fathoms. They cut a trench at a little diſtance from the top of the groove, covering it with turf and rods diſpoſed to receive the pipe, which they contrive to come in ſideways to their groove, four feet from the top; which carries down the air to a great depth. When they come at ore, and need an air-ſhaft, they ſink it four or five fathoms diſtant, according to the convenience of the breadth, and of the ſame faſhion with the groove, to draw, as well ore as air.

Air-Threads, in natural hiſtory, a name given to the long filaments, ſo frequently ſeen in autumn floating about in the air.

Theſe threads are the work of ſpiders, eſpecially of that ſpecies called the long-legged field-ſpider; which, having mounted to the ſummit of a buſh or tree, darts from its tail ſeveral of theſe threads, till one is produced capable of ſupporting the creature in the air: on this it mounts in queſt of prey, and frequently riſes to a very conſiderable height. See Aranea.

Air-Veſſels, are ſpiral ducts in the leaves, &c. of plants, ſuppoſed to be analogous to the lungs of animals, in ſupplying the different parts of a plant with air. See the article Plants.

Air, in mythology, was adored by the Heathens under the names of Jupiter and Juno; the former repreſenting the ſuperior and finer part of the atmoſphere, and the latter the inferior and groſſer part. The augurs alſo drew preſages from the clouds, thunder, lightning, &c.

Air, in painting, &c. denotes the manner and very life of action; or it is that which expreſſes the diſpoſition of the agent.—It is ſometimes alſo uſed in a ſynonimous ſenſe with geſture or attitude.

Air, in muſic, is taken in different ſenſes. It is ſometimes contraſted with harmony; and, in this ſenſe, it is ſynonimous with melody in general.—Its proper meaning is, A tune, which is ſet to words, or to ſhort pieces of poetry that are called *ſongs*.

In operas, we give the name of *air* to ſuch pieces of muſic as are formed with meaſures and cadences, to diſtinguiſh it from the recitative; and, in general, every piece of muſic is called an *air*, which is formed for the voice, or even for inſtruments, and adapted to ſtanzas, whether it forms a whole in itſelf, or whether it can be detached from any whole of which it forms a part, and be executed alone.

If the ſubject admits of harmony, and is ſet in parts, the *air* is, according to their number, denominated a *duett*, a *trio*, a *quartetto*, &c. We need not follow Rouſſeau, and other philologiſts, in their endeavours to inveſtigate the etymon of the word *air*. Its derivation, though found and aſcertained, would contribute little to illuſtrate its meaning in that remote ſenſe, to which, through a long continuance of time, and the various viciſſitudes of language, it has now paſſed. The curious may conſult the ſame article in the *Dictionnaire de Muſique* by M. Rouſſeau.

In modern muſic, there are ſeveral different kinds of *airs*, each of which agrees to a certain kind of dancing, and from theſe dances the airs themſelves take their ſpecific names.

The *airs* of our operas, are, if we may be permitted the expreſſion, the canvaſs or ſubſtratum upon which are painted all the pictures of imitative muſic; melody is the deſign, and harmony the colouring; every pictureſque object ſelected from the moſt beautiful parts of nature, every reflected ſentiment of the human heart, are the models which the artiſt imitates: whatever gains attention, whatever intereſts the ſoul, whatever charms the ear, or cauſes emotion in the heart, theſe are the objects of his imitation. See IMITATION. An air which delights the ear, and diſcovers the learning of the compoſer; an air invented by genius, and compoſed with taſte; is the nobleſt effort of muſic: it is this which explores the compaſs, and diſplays the delicacy, of a beautiful voice: it is in this where the charms of a well-conducted ſymphony ſhine; it is by this, that the paſſions, excited and inflamed by nice gradations, reach and agitate the ſoul through the avenues of external ſenſe. After hearing a beautiful *air*, the mind is acquieſcent and ſerene: the ear is ſatisfied, not diſguſted: it remains impreſſed on the fancy, it becomes a part of our eſſence, we carry it with us, we are able to repeat it at pleaſure: without the ability acquired by habit to breathe a ſingle note of it, we execute it in our imagination in the ſame manner as we heard it upon the theatre: one ſees the ſcene, the actor, the theatre; one hears the accompaniments and the applauſes. The real enthuſiaſt in muſic never forgets the beautiful airs which he has heard; when he chooſes, he cauſes the opera to recommence.

The words to which *airs* are adapted, are not always rehearſed in regular ſucceſſion, nor ſpoken in the ſame manner with thoſe of the recitative; and though, for ordinary, they are very ſhort, yet they are interrupted, repeated, tranſpoſed, at the pleaſure of the artiſt. They do not conſtitute a narrative, which once told is over: they either delineate a picture, which it is neceſſary to contemplate in different points of view; or inſpire a ſentiment in which the heart acquieſces with pleaſure, and from which it is neither able nor willing to be diſengaged; and the different phraſes of the *air*, are nothing elſe but different manners of beholding the ſame image. This is the reaſon why the ſubject of an *air* ſhould be one. It is by theſe repetitions properly placed, it is by theſe redoubled efforts, that an impreſſion, which at firſt was not able to move you, at length ſhakes your ſoul, agitates you, tranſports you out of yourſelf: and it is likewiſe upon the ſame principle, that the runnings, as they are called, or thoſe long, mazy, and inarticulated inflections of the voice, which, in pathetic *airs*, frequently ſeem, though they are not always ſo, improperly placed; whilſt the heart is affected with a ſentiment exquiſitely moving, it often expreſſes its emotions by inarticulate ſounds, more ſtrongly and ſenſibly than it could do by words themſelves.

The form of *airs* is of two kinds. The ſmall airs are often compoſed of two ſtrains, which ought each of them to be ſung twice; but the important airs in operas are frequently in the form of rondeaus.

AIR, or *Ayr*, in geography, a town of Scotland, capital of an extenſive county of the ſame name. It ſtands on the river Air, and was formerly a place of good trade, and ſeat of fiſheries; all of which have vaniſhed, and the people now live by one another. Air appears, from hiſtory and other documents, to have been a conſiderable place at the time of the Norman conqueſt. The vouchers of its antiquity are corroborated by an elegant building, called the *Croſs*, which hath eſcaped the deſtructive rage of the laſt and preceding century. The date on this fragment of antiquity is 1055, conſequently it hath ſtood in its place above 735 years; and it is to be wiſhed, that the majority of the inhabitants may unite in preſerving it from being deſtroyed by perſons who have expreſſed a ſtrong deſire to that purpoſe. In 1557, the tax levied upon Air was L. 236 Scots; upon Glaſgow only L. 202. In 1771, Air was aſſeſſed at 15 s. Sterl. and Glaſgow at L. 18, 10s. In 1751, the pickled herrings exported from Air were 6624 barrels; ſince the year 1777, none. Theſe revolutions appear the more extraordinary, when we conſider the very advantageous ſituation of Air both by land and water; the fertility of the country; the riches of the ſea; its contiguity to the weſtern fiſheries on one ſide, and to Glaſgow on the other; the large returns for cattle, grain, and coal; the ample revenues of the town; and particularly the conveniency of its harbour for fiſhing-veſſels of every conſtruction.—About a mile north from the town there is a lazar-houſe, commonly called *The King's Chapel*, which King Robert de Bruce ſet apart for the maintenance of lepers.

AIRA, in botany: A genus of the triandria digynia claſs; and in the natural method ranking under the 4th order, *Gramina*. The characters are: The *calyx* is a two-flowered double-valved glume: The *corolla* is two-valved, and no rudiment of a flower between the florets: The *ſtamina* conſiſt of three capillary filaments the length of the flower; the antheræ are oblong, and forked at both ends: The *piſtillum* is an egg-ſhaped germen; the ſtyli are two, briſtly, and expanding; the ſtigmata are pubeſcent: There is no *pericarpium*; the including corolla grows to the ſeed: The *ſeed* is egg-ſhaped and covered. There are 14 ſpecies of the aira; nine of which are natives of Britain. The Engliſh name is *Hair-graſs*. See the general article GRASS.

AIRANI, in church-hiſtory, an obſcure ſect of Arians, in the fourth century, who denied the conſubſtantiality of the Holy Ghoſt with the Father and the Son. They are otherwiſe called *Airaniſtæ*; and are ſaid to have taken their name from one *Airas*, who diſtinguiſhed himſelf at the head of this party, in the reigns of Valentinian and Gratian.

AIRE, a town of France, in Proper Gaſcony, of which it is the capital, with a biſhop's ſee. It is ſeated on the river Adour, on the declivity of a mountain. E. Long. 0. 3. N. Lat. 43. 47.

AIRE, a ſtrong town in the Netherlands, in the county of Artois, with a caſtle. It was taken by the French in 1710, and was confirmed to them by the treaty of Utrecht. It is ſeated on the river Lis, 22 miles ſouth of Dunkirk, and communicates with St Omer's by a canal cut from the river Aa. E. Long. 2. 31. N. Lat. 50. 38.

AIRING, a term peculiarly uſed for the exerciſing horſes in the open air. It purifies the blood; purges the body from groſs humours; and, as the jockies expreſs it, teaches the horſe how to make his wind rake equally, and keep time with the other motions of his body. It alſo ſharpens the ſtomach, and keeps the creature hungry: which is a thing of great conſequence, as hunters and racers are very apt to have their ſtomach fall off, either from want of exerciſe, or from the too violent exerciſe which they are often expoſed to. If the horſe be over fat, it is beſt to air him before ſun-riſe and after ſun-ſetting; and in general, it is allowed by all, that nothing is more beneficial to thoſe creatures than early and late airings. Some of our modern managers, however, diſpute this: they ſay, that the cold of theſe times is too great for the creature; and that if, in particular, he is ſubject to cattarrhs, rheums, or the like complaints, the dews and cold fogs, in theſe early and late airings, will be apt to increaſe all thoſe diſorders. Nature, we ſee, alſo points out the ſun-beams as of great uſe to theſe animals; thoſe which are kept hardy and lie out all night, always running to thoſe places where the ſunſhine comes, as ſoon as it appears in a morning. This ſhould ſeem to recommend thoſe airings that are to be made before ſun-ſet, and a little time after ſun-riſe. As to the caution, ſo earneſtly inculcated by Markham, of uſing theſe early and late airings for fat horſes, it is found unneceſſary by many: for they ſay, that the ſame effect may be produced by airings at warmer times, provided only that they are made longer; and that, in general, it is from long airings that we are to expect to bring a horſe to a perfect wind and ſound courage.

AIRS, in the manege, are the artificial motions of taught horſes; as the demivolt, curvet, capriole, &c.

AIRY, or AERY, among ſportſmen, a term expreſſing the neſt of a hawk or eagle.

AIRY Triplicity, among aſtrologers, denotes the three ſigns, gemini, libra, and aquarius.

AISNE, a river of France, which riſes in Champaign, and runs W. by Soiſons in the iſle of France, falling into the river Oiſe, a little above Campeigne.

AITOCZU, a conſiderable river of Leſſer Aſia, which, ariſing in the mountain Taurus, falls into the ſouth part of the Euxine ſea.

AJUGA, BUGLE: a genus of the gymnoſpermia order, belonging to the didynamia claſs of plants; and in the natural method ranking under the 42d order, *Aſperifoliæ*. The characters are: The *calyx* is a ſhort perianthium, monophyllous and perſiſtent: The *corolla* is monopetalous and grinning: The *ſtamina* conſiſt of four erect ſubulated filaments; the antheræ are dimidiated: The *piſtillum* has a four-cleft germen, a filiform ſtylus, and two ſlender ſtigmata. There is no *pericarpium*; the calyx converging, and containing the ſeeds in its boſom: The *ſeeds* are four, and oblong. The *Species* enumerated by Linnæus are, 1. The orientalis, with inverted flowers, which is a native of the eaſt. 2. The genevenſis, with woolly leaves and hairy cups, is a native of Swiſſerland and of the ſouthern parts of Europe. 3. The pyramidalis, or mountain-bugle, with a ſquare pyramidal ſpike, and blue flowers, is a native of Sweden, Germany, Swiſſerland, and the hilly parts of Britain. Sheep and goats eat it; cows are not fond of it; horſes and ſwine refuſe it. 4. The reptans, common or paſture bugle, with creeping ſuckers, and blue, red, or white bloſſoms, in long leafy ſpikes, is a native of the ſouthern parts of Europe, and is met with in woods and moiſt places in many parts of Britain. The roots are aſtringent, and ſtrike a black colour with vitriol of iron.

Culture. The firſt ſpecies is propagated by ſowing the ſeeds ſoon after they are ripe, in a pot filled with loamy earth, and placed in a ſhady ſituation till autumn; when it muſt be removed under a frame, and protected from the froſts. In the ſpring, after the plants are come up, let them be tranſlated each into a ſeparate pot, and in ſummer placed under a ſhady ſituation. The other ſorts are eaſily propagated by their ſide-ſhoots, and ſucceed beſt in a moiſt ſhady ſituation.

AIUS LOCUTIUS, the name of a deity to whom the Romans erected an altar.—The words are Latin, and ſignify "a ſpeaking voice."—The following accident gave occaſion to the Romans erecting an altar to the Aius Locutius. One M. Seditius, a plebeian, acquainted the tribunes, that, in walking the ſtreets by night, he had heard a voice over the temple of Veſta, giving the Romans notice that the Gauls were coming againſt them. This intimation was however neglected; but after the truth was confirmed by the event, Camillus acknowledged this voice to be a new deity, and erected an altar to it under the name of the *Aius Locutius*.

AJUTAGE, or ADJUTAGE, a kind of tube fitted to the mouth of the veſſel through which the water of a fountain is to be played. To the different form and ſtructure of ajutages, is owing the great variety of fountains. See FOUNTAIN and HYDROSTATICS.

AIX, a ſmall, but ancient town in the duchy of Savoy, with the title of a marquiſate. It is ſeated on the lake Bourget, at the foot of a mountain, between Chamberry, Annecy, and Rumilly. There is here a triumphal arch of the ancient Romans, but it is almoſt entirely ruined. The mineral waters bring a great number of ſtrangers to this place. The place was originally called *Aquæ Gratianæ*, from the hot baths built there by the Emperor Gratian. E. Long. 7. 10. N. Lat. 45. 40.

AIX, an ancient city, the capital of Provence, in France. It is an archbiſhopric; and has a parliament, a court of aids, a chamber of accounts, a ſeneſchal's juriſdiction, a generality, and an univerſity. It has that air of ſilence and gloom ſo commonly characteriſtic of places deſtitute of commerce or induſtry: It is, however, a well-built city; and moſt like Paris of any place in the kingdom, as well for the largeneſs of the buildings, as in reſpect of the politeneſs of the inhabitants. It is embelliſhed with abundance of fine fountains, and ſeveral beautiful ſquares. The preachers ſquare is on the ſide of a hill; it is about 160 yards in length, and is ſurrounded with trees, and houſes built with ſtone three ſtories high. The town-hall is at one end of the city, and is diſtributed into ſeveral fine apartments: the two loweſt are taken up by the board of accounts, and by the ſeneſchal; that above it is deſigned for the ſeſſions of parliament. The hall of audience is adorned with the pictures of the kings of France on horſeback. The hotel of the city is a handſome building, but hid by the houſes of the narrow ſtreet in which it is placed. The cathedral church is a Gothic ſtructure, with tombs of ſeveral earls of Provence, and ſome good pictures by French maſters. The Corſe, or Orbitelle, is a magnificent walk, above 300 yards long, formed by a triple avenue of elms, and two rows of regular and ſtately houſes. The church of the fathers of the oratory is a handſome building; and not far from thence is the chapel of the blue penitents, which is full of paintings. The convent of preachers is very fine; in their church is a ſilver ſtatue of the Virgin Mary almoſt as big as the life. There are other churches and buildings which contain a great number of rarities. The baths without the city, which were diſcovered not long ſince, have good buildings, raiſed at a vaſt expence, for the accommodation of thoſe who drink the waters. Although Aix was the firſt Roman ſettlement in Gaul, it is not remarkable for ancient remains. The warm ſprings from which it is now known and frequented, induced Sextus Calvinus to found a colony here, to which he gave the name of *Aquæ Sextiæ*. They are ſuppoſed to poſſeſs particular virtues in caſes of debility; and ſeveral altars have been dug up ſacred to Priapus, the inſcriptions on which indicate their gratitude to that deity for his ſuppoſed ſuccour and aſſiſtance. E. Long. 5. 32. N. Lat. 43. 32.

Aix, a ſmall iſland on the coaſt of France, between the iſle of Oleron and the continent. It is twelve miles north-weſt of Rochfort, and twelve ſouth-ſouth-weſt of Rochelle. W. Long. 1. 4. N. Lat. 46. 5.

Aix la chapelle, a fine city of Germany, in the circle of Weſtphalia, and duchy of Juliers.

All authors are agreed about its antiquity, it being mentioned in Cæſar's Commentaries and the Annals of Tacitus. The Romans had colonies and fortreſſes there, when they were at war with the Germans; but the mineral waters and the hot baths ſo increaſed its fame, that, in proceſs of time, it was advanced to the privileges of a city, by the name of Aquægranii, that is, the waters of Granius; that which it has now, of *Aix la Chapelle*, was given it by the French, to diſtinguiſh it from the other Aix. It is ſo called, on account of a chapel built in honour of the Holy Virgin by Charlemagne; who having repaired, beautified, and enlarged the city, which was deſtroyed by the Huns in the reign of Attila, in 451, made it the uſual place of his reſidence. The town is ſeated in a valley ſurrounded with mountains and woods, and yet the air is very wholeſome. It may be divided into the inward and outward city. The inward is incompaſſed with a wall about three quarters of a league in circumference, having ten gates; and the outward wall, in which there are eleven gates, is about a league and a half in circumference. There are rivulets which run through the town and keep it very clean, turning ſeveral mills; beſides twenty public fountains, and many private ones. They have ſtone-quarries in the neighbourhood, which furniſh the inhabitants with proper materials for their magnificent buildings, of which the ſtadthouſe and the cathedral are the chief. There are likewiſe thirty parochial or collegiate churches. The market-place is very ſpacious, and the houſes round it are ſtately. In the middle, before the ſtadthouſe, is a fountain of blue ſtones, which throws out water, from ſix pipes, into a marble baſon placed beneath, thirty feet in circumference. On the top of this fountain, is placed the ſtatue of Charlemagne, of braſs, gilt, holding a ſceptre in his right hand, and a globe in his left. The ſtadthouſe is adorned with the ſtatues of all the emperors ſince Charlemagne. This fabric has three ſtories, the upper of which is one entire room of 162 feet in length and 60 in breadth. In this the new-elected emperor formerly entertained all the electors of the empire.

Aix la chapelle is a free imperial city, and changes its magiſtracy every year on the eve of St John Baptiſt. The mayor is in the nomination of the elector palatine, in the quality of the duke of Juliers, as protector of the city. This place is famous for ſeveral councils and treaties of peace concluded here; particularly thoſe between France and Spain in 1668, and between Great Britain and France in 1748.

The hot ſulphureous waters for which this place has ſo long been celebrated, ariſe from ſeveral ſources, which ſupply eight baths conſtructed in different parts of the town. Theſe waters near the ſources are clear and pellucid; and have a ſtrong ſulphureous ſmell reſembling the waſhings of a foul gun; but they loſe this ſmell by expoſure to air. The taſte is ſaline, bitter, and urinous. They do not contain iron. They are alſo neutral near the fountain, but afterwards are manifeſtly and pretty ſtrongly alkaline, inſomuch that clothes are waſhed with them without ſoap.—On the vaults above the ſprings and aqueducts of theſe waters is found, every ſpring when they are opened, a quantity of fine white-coloured flowers of ſulphur, which has been ſublimed from the waters.

The heat of the water of the hotteſt ſpring, by Dr Lucas's account, raiſes the quickſilver of Fahrenheit's thermometer to 136—by Monſ. Monet's account, to 146—and the heat of the fountain, where they commonly drink, by Dr Lucas's account, to 112.

Dr Simmons has given the following account of their ſeveral temperatures, as repeatedly obſerved by himſelf with a thermometer conſtructed by Nairne.

The ſpring which ſupplies the Emperor's bath *(Bain de l'Empereur)*, the New Bath *(Bain Neuf)*, and the Queen of Hungary's bath *(Bain de la Reine de Hongrie)*, - -	127°
St Quirin's bath *(Bain de St Quirin)*,	112°
The Roſe bath *(Bain de la Roſe)*, and the Poor's bath *(Bain des Pauvres)*, both which are ſupplied by the ſame ſpring, - -	112°
Charles's bath *(Bain de Charles)*, and St Corneille's bath *(Bain de St Corneille)*, -	112°
The ſpring uſed for drinking is in the High Street, oppoſite to Charles's bath; the heat of it at the pump is - - - -	106°

Dr Lucas evaporated the water of the hotteſt ſpring (of the Emperor's Bath), and obtained 268 grains of ſolid matter from a gallon, compoſed of 15 grains of calcareous earth, 10 grains of ſelenites, and 243 grains of a ſaline matter made up of natron and ſea ſalt. They are at firſt nauſeous and harſh, but by habit become familiar and agreeable. At firſt drinking, alſo, they generally affect the head. Their general operation is by ſtool and urine, without griping or diminution of ſtrength; and they alſo promote perſpiration.

The quantity to be drank as an alterative is to be varied according to the conſtitution and other circumſtances of the patient. In general, it is beſt to begin with a quarter or half a pint in the morning, and increaſe the doſe afterwards to pints, as may be found convenient. The water is beſt drank at the fountain. When it is required to purge, it ſhould be drank in large and often-repeated draughts.

In regard to bathing, this alſo muſt be determined by the age, ſex, ſtrength, &c. of the patient, and by the ſeaſon. The degree of heat of the bath ſhould likewiſe be conſidered. The tepid ones are in general the beſt, though there are ſome caſes in which the hotter ones are moſt proper. But even in theſe, it is beſt to begin with the temperate baths, and increaſe the heat gradually.

Theſe waters are efficacious in diſeaſes proceeding from indigeſtion and from foulneſs of the ſtomach and bowels. In rheumatiſms; in the ſcurvy, ſcrophula, and diſeaſes of the ſkin; in hyſteric and hypochondriacal diſorders; in nervous complaints and melancholy; in the ſtone and gravel; in paralytic complaints; in thoſe evils which follow an injudicious uſe of mercury; and in many other caſes. They ought not, however, to be given in hectic caſes where there is heat and fever, in putrid diſorders, or where the blood is diſſolved, or the conſtitution much broken down.

The time of drinking, in the firſt ſeaſon, is from the beginning of May to the middle of June; and, in the latter ſeaſon, from the middle of Auguſt to the latter end of September.

There are galleries or piazzas under which the company walk during the time of drinking, in order to promote the operation of the waters.—The poor's bath is free for every body, and is frequented by crowds of poor people.

It is ſcarcely neceſſary to add, that there are all kinds of amuſements common to other places of public reſort; but the ſharpers appear more ſplendid here than elſewhere, aſſuming titles, with an equipage ſuitable to them.—Aix la Chapelle is 21 miles from Spa, 36 from Liege, and 30 from Cologne. E. Long. 5. 48. N. Lat. 51. 55.

AIZOON, called by Mr Miller *ſempervive;* though the name Aizoon has been by ſome writers applied to the houſe-leek, and alſo to the aloes: A genus of the pentagynia order, belonging to the icoſandria claſs of plants; and in the natural method ranking under the 13th order, *Succulentæ.* The characters are: The *calyx* is a ſingle-leaved perianthium, divided into five ſegments, and perſiſtent: There is no *corolla:* The *ſtamina* conſiſt of very numerous capillary filaments; the antheræ are ſimple: The *piſtillum* has a five-cornered germen above, with five ſimple ſtyli; and the ſtigmata are ſimple. The *pericarpium* is a bellied, retuſe, five-cornered capſule, having five cells and five valves: The *ſeeds* are many and globular.—Linnæus mentions three ſpecies; the canarienſe, hiſpanicum, and paniculatum. The firſt is a native of the Canary iſlands, the ſecond of Spain, and the third of the Cape of Good Hope. They may all be raiſed in Britain on hot-beds; but as they are not remarkable either for beauty or any other property, it appears unneceſſary to take further notice of them.

AKENSIDE (Mark) a phyſician, who publiſhed in Latin "A Treatiſe upon the Dyſentery," in 1764, and a few pieces in the firſt volume of the "Medical Tranſactions" of the college of phyſicians, printed in 1768; but far better known, and to be diſtinguiſhed chiefly hereafter as a poet. He was born at Newcaſtle-upon-Tyne, November 9, 1721; and after being educated at the grammar-ſchool in Newcaſtle, was ſent to the univerſities of Edinburgh and Leyden; at which laſt he took his degree of Doctor in Phyſic. He was afterwards admitted by mandamus to the ſame degree at Cambridge; elected a fellow of the college of phyſicians, and one of the phyſicians of St Thomas's Hoſpital; and, upon the eſtabliſhment of the queen's houſehold, appointed one of the phyſicians to her majeſty.

That Dr Akenſide was able to acquire no other kind of celebrity than that of a ſcholar and a poet, is to be accounted for by the following particulars in his life and conduct, related by Sir John Hawkins.—Mr Dyſon and he were fellow-ſtudents, the one of law and the other of phyſic, at Leyden; where, being of congenial tempers, a friendſhip commenced between them that laſted through their lives. They left the univerſity at the ſame time, and both ſettled in London: Mr Dyſon took to the bar, and being poſſeſſed of a handſome fortune, ſupported his friend while he was endeavouring to make himſelf known as a phyſician; but in a ſhort time, having purchaſed of Mr Hardinge his place of clerk of the houſe of commons, he quitted Weſtminſter-hall; and for the purpoſe of introducing Akenſide to acquaintance in an opulent neighbourhood near the town, bought a houſe at North-End, Hampſtead; where they dwelt together during the ſummer ſeaſon, frequenting the long-room, and all clubs and aſſemblies of the inhabitants.

At theſe meetings, which, as they were not ſelect, muſt be ſuppoſed to have conſiſted of ſuch perſons as uſually meet for the purpoſe of goſſiping, men of wealth, but of ordinary endowments, and able to talk of little elſe than news, and the occurrences of the day, Akenſide was for diſplaying thoſe talents which had acquired him the reputation he enjoyed in other companies: but here they were of little uſe to him; on the contrary, they tended to engage him in diſputes that betrayed him into a contempt of thoſe that differed in opinion from him. It was found out that he was a man of low birth, and a dependent on Mr Dyſon; circumſtances that furniſhed thoſe whom he offended with a ground of reproach, that reduced him to the neceſſity of aſſerting in terms that he was a gentleman.

Little could be done at Hampſtead after matters had proceeded to this extremity: Mr Dyſon parted with his villa at North-End, and ſettled his friend in a ſmall houſe in Bloomſbury-ſquare; aſſigning for his ſupport ſuch a part of his income as enabled him to keep a chariot.—In this new ſituation Akenſide uſed every endeavour to become popular, but defeated them all, by the high opinion he every where manifeſted of himſelf, and the little condeſcenſion he ſhowed to men of inferior endowments; by his love of political controverſy, his authoritative cenſure of the public councils, and his bigotted notions reſpecting government; ſubjects foreign to his profeſſion, and with which ſome of the wiſeſt of it have thought it prudent not to concern themſelves. In the winter evenings he frequented Tom's coffee-houſe in Devereux-court, then the reſort of ſome of the moſt eminent men for learning and ingenuity of the time; with ſome of whom he became intangled in diſputes and altercations, chiefly on ſubjects of literature and politics, that fixed on his character the ſtamp of haughtineſs and ſelf-conceit, and drew him into diſagreeable ſituations. Hence many, who admired him for his genius and parts, were ſhy of becoming his intimates.

The value of that precept which exhorts us to live peaceably with all men, or in other words, to avoid creating enemies, can only be eſtimated by the reflection on thoſe many amiable qualities againſt which the neglect of it will preponderate. Akenſide was a man of religion and ſtrict virtue; a philoſopher, a ſcholar, and a fine poet. His converſation was of the moſt delightful kind; learned, inſtructive, and without any affectation of wit, cheerful and entertaining.

Dr Akenſide died of a putrid fever, June 23. 1770; and is buried in the pariſh-church of St James's, Weſtminſter.

His poems, publiſhed ſoon after his death in 4to and 8vo, conſiſt of "The Pleaſures of Imagination," two books of "Odes," a "Hymn to the Naiads," and ſome "Inſcriptions." "The Pleaſures of Imagination," his capital work, was firſt publiſhed in 1744; and a very extraordinary production it was from a man who had not reached his 23d year. He was afterwards ſenſible, however, that it wanted reviſion and correction; and he went on reviſing and correcting it for ſeveral years: but finding this taſk to grow upon his hands, and deſpairing of ever executing it to his own ſatisfaction, he abandoned the purpoſe of correcting, and reſolved to write the poem over anew upon a ſomewhat different and enlarged plan. He finiſhed two books of his new poem, a few copies of which were printed for the uſe of the author and certain friends; of the firſt book in 1757, of the ſecond in 1765. He finiſhed alſo a good part of a third book, and an introduction to a fourth; but his moſt munificent and excellent friend, conceiving all that is executed of the new work, too inconſiderable to ſupply the place, and ſuperſede the republication of the original poem, and yet too valuable to be withheld from the public, hath cauſed them both to be inſerted in the collection of his poems.

AKIBA, a famous rabbin, flouriſhed a little after the deſtruction of Jeruſalem by Titus. He kept the flocks of a rich citizen of Jeruſalem till the 40th year of his age, and then applied himſelf to ſtudy in the academies for 24 years; and was afterwards one of the greateſt maſters in Iſrael, he having 24,000 ſcholars. He declared for the impoſtor Barchochebas, whom he owned for the Meſſiah; and not only anointed him king, but took upon himſelf the office of his maſter of the horſe. The troops which the emperor Hadrian ſent againſt the Jews, who under the conduct of this falſe Meſſiah had committed horrid maſſacres, exterminated this faction. Akiba was taken and put to death with great cruelty. He lived 120 years; and was buried with his wife in a cave upon a mountain not far from Tiberias, and his 24,000 ſcholars were buried round about him upon the ſame mountain. It is imagined he invented a ſuppoſititious work under the name of the patriarch Abraham.

AKISSAT, the ancient Thyatira, a city in Natolia, in Aſia, ſituated in a plain 18 miles broad, which produces plenty of cotton and grain. The inhabitants, who are reckoned to be about 5000, are ſaid to be all Mahometans. The houſes are built of nothing but earth or turf dried in the ſun, and are very low and ill contrived: but there are ſix or ſeven moſques, which are all of marble. There are remarkable inſcriptions on marble in ſeveral parts of the town, which are part of the ruins of ancient Thyatira. It is ſeated on the river Hermus, 50 miles from Pergamos. E. Long. 28. 30. N. Lat. 38. 50.

AKOND, an officer of juſtice in Perſia, who takes cognizance of the cauſes of orphans and widows; of contracts, and other civil concerns. He is the head of the ſchool of law, and gives lectures to all the ſubaltern officers; he has his deputies in all the courts of the kingdom, who, with the ſecond *ſadra*, make all contracts.

AL, an Arabic particle prefixed to words, and ſignifying much the ſame with the Engliſh particle *the*: Thus they ſay, alkermes, alkoran, &c. i. e. the kermes, the koran, &c.

AL, or ALD, a Saxon term frequently prefixed to the names of places, denoting their antiquity; as Aldborough, Aldgate, &c.

ALA, a Latin term properly ſignifying a wing; from a reſemblance to which ſeveral other things are called by the ſame name: Thus,

ALA, is a term uſed by botaniſts for the hollow of a ſtalk, which either the leaf, or the pedicle of the leaf, makes with it; or it is that hollow turning, or ſinus, placed between the ſtalk or branch of a plant and the leaf, whence a new offspring uſually iſſues. Sometimes it is uſed for thoſe parts of leaves otherwiſe called *lobes*, or *wings*.

ALÆ (the plural number) is uſed to ſignify thoſe petals or leaves of papilionaceous flowers, placed between thoſe others which are called the *vexillum* and *carina*, and which make the top and bottom of the flowers. Inſtances of flowers of this ſtructure are ſeen in thoſe of peaſe and beans, in which the top leaf or petal is the vexillum, the bottom the carina, and the ſide ones the alæ.

ALÆ is alſo uſed for thoſe extremely ſlender and membranaceous parts of ſome ſeeds, which appear as wings placed on them; it likewiſe ſignifies thoſe membranaceous expanſions running along the ſtems of ſome plants, which are therefore called *alated ſtalks*.

ALÆ, in anatomy, a term applied to the lobes of the liver, the cartilages of the noſtril, &c.

ALÆ, in the Roman art of war, were the two wings, or extreme parts of the army drawn up in the order of battle.

ALABA, one of the three ſmalleſt diſtricts of Biſcay in Spain, but pretty fertile in rye, barley, and fruits. There are in it very good mines of iron, and it had formerly the title of a kingdom.

ALABANDA (anc. geog.), a town of Caria, near the Meander, ſituate beneath eminences reſembling aſſes with pack-ſaddles, which gave riſe to the jeſt; and between Amyzo to the weſt and Stratonice to the eaſt. Under the Romans they enjoyed aſſizes, or a convention of juriſdiction, by Pliny reckoned the fourth in order; hence the proverb in Stephanus, expreſſing their happineſs. It was built by Alabandus, whom therefore they deemed a god. The people were called *Alabandi*, *Alabandenſes*, Cicero; and *Alabandeis*, after the Greek manner, in coins of Auguſtus and Claudius; they were alſo called *Alabendeni* (Livy).

ALABARCHA, in antiquity, a kind of magiſtrates among the Jews of Alexandria, whom the emperors allowed them to elect, for the ſuperintendency of their policy, and to decide differences and diſputes which aroſe among them.

ALABASTER (William), an Engliſh divine, was born at Hadley in the county of Suffolk. He was one of the Doctors of Trinity college in Cambridge; and he attended the earl of Eſſex as his chaplain in the expedition to Cadiz in the reign of queen Elizabeth. It is ſaid, that his firſt reſolutions of changing his religon were occaſioned by his ſeeing the pomp of the churches of the Roman communion, and the reſpect with which the prieſts ſeemed to be treated amongſt them; and appearing thus to waver in his mind, he ſoon found perſons who took advantage of this diſpoſition of his, and of the complaints which he made of not being advanced according to his deſerts in England, in ſuch a manner, that he did not ſcruple to go over to the Popiſh religion, as ſoon as he found that there was no ground to hope for greater encouragement in his own country. However that matter is, he joined himſelf to the Romiſh communion, but was diſappointed in his expectations. He was ſoon diſpleaſed at this; he could not reconcile himſelf to the diſcipline of that church, which made no conſideration of the degrees which he had taken before. It is probable too that he could not approve of the worſhip of creatures, which proteſtants are uſed to look upon with horror. Upon this he returned to England, in order to reſume his former religion. He obtained a prebend in the cathedral of St Paul, and after that the rectory of Therfield in Hertfordſhire. He was well ſkilled in the Hebrew tongue; but he gave a wrong turn to his genius by ſtudying the Cabbala, with which he was ſtrangely infatuated. He gave a proof of this in a ſermon which he preached upon taking his degree of doctor of divinity at Cambridge. He took for his text the beginning of the firſt book of Chronicles, Adam, Seth, Enos; and having touched upon the literal ſenſe, he turned immediately to the myſtical, aſſerting, that Adam ſignified miſfortune and miſery, and ſo of the reſt. His verſes were greatly eſteemed. He wrote a Latin tragedy, intitled *Roxana;* which, when it was acted in a college at Cambridge, was attended with a very remarkable accident. There was a lady who was ſo terrified at the laſt word of the tragedy, *Sequar, Sequar,* which was pronounced with a very ſhocking tone, that ſhe loſt her ſenſes all her lifetime after. Alabaſter was living in 1630. His *Apparatus in Revelationem Jeſu Chriſti* was printed at Antwerp in 1607. As for his *Spiraculum tubarum, ſeu fons Spiritualium Expoſitionum ex æquivocis Pentaglotti ſignificationibus,* and his *Ecce Sponſus venit, ſeu tuba pulchritudinis, hoc eſt demonſtratio quod non ſit illicitum nec impoſſibile computare durationum mundi & tempus ſecundi adventus Chriſti,* they were printed at London. We may judge from theſe titles what the taſte and genius of the author was.

ALABASTER, in natural hiſtory, a ſpecies of that genus of ſtones whoſe baſe is calcareous earth. It differs from marble in being combined, not with the aërial, but with vitriolic acid; therefore, when mixed with any acid, no efferveſcence appears. It is ſoluble in about 500 times its weight of water at the temperature of 60. It is fuſible alone in a long-continued porcelain heat, or by the blow-pipe. Specific gravity 1.87. Texture, granular, with ſhining particles. In compoſition, and conſequently in its chemical properties, it does not differ from gypſum, ſelenite, and plaſter of Paris.

There are three ſpecies of alabaſter. 1. The ſnow-white ſhining alabaſter, or lygdinum of the ancients, is found in Taurus, in pieces large enough to make diſhes, or the like. It cuts very freely, and is capable of a fine poliſh. 2. The yellowiſh alabaſter, or phengites of Pliny, is found in Greece; and is of a ſoft looſe open texture, pretty heavy, and nearly of the colour of honey. This ſpecies has likewiſe been found in Germany, France, and in Derbyſhire in England. 3. Variegated, yellow, and reddiſh alabaſter. This ſpecies is the common alabaſter of the ancients, and is ſo ſoft that it may be cut with a knife: It is remarkably bright, and almoſt tranſparent; admits of a fine poliſh, and conſiſts of large angular ſparry concretions. It is not proof againſt water; it ferments violently with aqua fortis, and burns to a pale yellow. The colour of this ſpecies is a clear pale yellow reſembling amber, and variegated with undulated veins; ſome of which are pale red, others whitiſh, and others of a pale brown. It was formerly brought from Egypt, but is now to be met with in ſeveral parts of England. The alabaſters are frequently uſed by ſtatuaries for ſmall ſtatues, vaſes, and columns. After being calcined and mixed with water, they may be caſt in any mould like plaſter of Paris. See GYPSUM.

Alabaſter, Mr Boyle obſerves, being finely powdered, and thus ſet in a baſon over the fire, will, when hot, aſſume the appearance of a fluid, by rolling in waves, yielding to the ſmalleſt touch, and emitting vapour; all which properties it loſes again on the departure of the heat, and diſcovers itſelf a mere incoherent powder. The fineneſs and clearneſs of this ſtone renders it in ſome meaſure tranſparent; whence it has been ſometimes alſo employed for windows. There is a church at Florence ſtill illuminated by alabaſter-windows; inſtead of panes of glaſs, there are ſlabs of alabaſter near 15 feet high, each of which forms a ſingle window, through which the light is conveyed. The countries in Europe which abound moſt in alabaſter are Germany, toward Coblentz; the province of Maconnois, in the neighbourhood of Cluni in France; Italy, toward Rome; where that of Montaiout is particularly remarkable not only for its whiteneſs, but alſo for the bigneſs of its blocks, ſome of which are ſo large, that ſtatues as big as the life may eaſily be cut out of them. F. Labat, in his journey to Italy, obſerves, that there are quarries of alabaſter in the neighbourhood of the village called de la Toffa, near Civita Vecchia: there is alſo alabaſter to be found in ſome places of Lorrain; but it is not much eſteemed. A new manufacture of baſſo relievos, from a ſingular ſpecies of factitious alabaſter, has been ſome time ago eſtabliſhed by M. Letapie, at the baths of St Philip in Tuſcany. The ſtream at theſe baths depoſites a peculiar kind of ſand, which, when collected and condenſed in the cavities of any body employed to oppoſe its current, acquires the nature, hardneſs, and colour of alabaſter, and aſſumes the forms of thoſe cavities in which it is thus lodged.

ALABASTER, in antiquity, a term uſed for a vaſe wherein odoriferous liquors were anciently put. The reaſon of the denomination is, that veſſels for this purpoſe were frequently made of the alabaſter-ſtone, which Pliny and other ancients repreſent as peculiarly proper for this purpoſe. Several critics will have the box mentioned in the Goſpels as made of alabaſter, to have been of glaſs: And though the texts ſay that the woman broke it, yet the pieces ſeem miraculouſly to have been united, ſince we are told the entire box was purchaſed by the emperor Conſtantine, and preſerved as

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a relic of great price. Others will have it, that the name *alabaſter* denotes the form rather than the matter of this box: In this view they define alabaſter by a box without a handle, deriving the word from the privative α, and λαϐη, *anſa, handle.*

Alabaſter is alſo ſaid to have been uſed for an ancient liquid meaſure, containing ten ounces of wine, or nine of oil. In this ſenſe, the alabaſter was equal to half the ſextary.

ALABASTRUM DENDROIDE, a kind of laminated alabaſter, beautifully variegated with the figures of ſhrubs, trees, &c. found in great abundance in the province of Hohenſtein.

ALADINISTS, a ſect among the Mahometans, anſwering to free-thinkers among us.

ALADULIA, a conſiderable province of Turky, in Aſia, in that part called Natolia, between the mountains of Antitaurus, which ſeparate it from Amaſia on the north, and from Carimania on the weſt. It has the Mediterranean ſea on the ſouth; and the Euphrates, or Frat on the eaſt, which divides it from Diarbeker. It comprehends the Leſſer Armenia of the ancients, and the eaſt part of Cilicia. Formerly it had kings of its own; but the head of the laſt king was cut off by Selim I. emperor of the Turks, who had conquered the country. It is now divided into two parts: the north, comprehended between Taurus, Antitaurus, and the Euphrates, is a beglerbeglic, which bears the name of Maraſh, the capital town; and the ſouth, ſeated between mount Taurus and the Mediterranean, is united to the beglerbeglic of Aleppo. The country is rough, ragged, and mountainous; yet there are good paſtures, and plenty of horſes and camels. The people are hardy and thieviſh. The capital is Malatigah.

ALAIN (Chartier), ſecretary to Charles VII. king of France, born in the year 1386. He was the author of ſeveral works in proſe and verſe; but his moſt famous performance was his Chronicle of king Charles VII. Bernard de Girard, in his preface to the Hiſtory of France, ſtyles him "an excellent hiſtorian, who has given an account of all the affairs, particulars, ceremonies, ſpeeches, anſwers, and circumſtances, at which he was preſent himſelf, or had information of." Giles Coroxet tells us, that Margaret, daughter to the king of Scotland, and wife to the dauphin, paſſing once through a hall where Alain lay aſleep, ſhe ſtopped and kiſſed him before all the company who attended: ſome of them telling her, that it was ſtrange ſhe ſhould kiſs a man who had ſo few charms in his perſon, ſhe replied, "I did not kiſs the man, but the mouth from whence proceed ſo many excellent ſayings, ſo many wiſe diſcourſes, and ſo many elegant expreſſions." Mr Fontenelle, among his Dialogues of the Dead, has one upon this incident, between the princeſs Margaret and Plato. Mr Paſquier compares Alain to Seneca, on account of the great number of beautiful ſentences interſperſed throughout his writings.

ALAIS, a conſiderable town of France, in the province of Languedoc, ſituated on the river Gardon, at the foot of the Cevennes. The Jeſuits had a college in this place; and a fort was built here in 1689. It is 34 miles north of Montpelier, and 340 from Paris. E. Lon. 4. 20. N. Lat. 44. 8.

ALAMANDUS (Lewis), in French *Aleman*, archbiſhop of Arles, and cardinal of St Cecilia, was one of the greateſt men of the fifteenth century. The cardinal preſided in the council of Baſil, which depoſed Eugenius IV. and elected the antipope Felix V. He is much commended by Æneas Sylvius, as a man extremely well formed for preſiding in ſuch aſſemblies, firm and vigorous, illuſtrious by his virtue, learned, and of an admirable memory in recapitulating all that the orators and diſputants had ſaid. One day, when he harangued againſt the ſuperiority of the pope over the council, he diſtinguiſhed himſelf in ſuch an eminent manner, that ſeveral perſons went to kiſs him, while others preſſed even to kiſs his robe. They extolled to the ſkies his abilities and genius, which had raiſed him, though a Frenchman, to a ſuperiority over the Italians, notwithſtanding all their natural ſubtlety and fineſſe. There is no need of aſking, whether Pope Eugenius thundered againſt the preſident of a council which depoſed him. He deprived him of all his dignities, and treated him as a ſon of iniquity. However, notwithſtanding this, Lewis Alamandus died in the odour of ſanctity, and performed ſo many miracles after his death, that at the requeſt of the canons and Celeſtine monks of Avignon, and the ſolicitation of the cardinal of Clermont legate *a latere* of Clement VII. he was beatified by that pope in the year 1527.

ALAMANNI (Lewis) was born at Florence, of a noble family, on the 28th of October 1495. He was obliged to fly his country for a conſpiracy againſt Julius de Medici, who was ſoon after choſen pope under the name of Clement VII. During this voluntary baniſhment, he went into France; where Francis I. from a love to his genius and merit, became his patron. This prince employed him in ſeveral important affairs, and honoured him with the collar of the order of St. Michael. About the year 1540, he was admitted a member of the Inflammati, an academy newly erected at Padua, chiefly by Daniel Barbaro and Ugolin Martelli. After the death of Francis, Henry duke of Orleans, who ſucceeded him in 1547, ſhowed no leſs favour to Alamanni; and in the year 1551, ſent him as his ambaſſador to Genoa: this was his laſt journey to Italy; and being returned to France, he died at Amboiſe on the 18th of April 1556, being in the 61ſt year of his age. He left many beautiful poems, and other valuable performances, in the Italian language. We have alſo ſome notes of his upon Homer's Iliad and Odyſſey; thoſe upon the Iliad were printed in the Cambridge edition of Homer in 1689, and Joſhua Barnes has alſo inſerted them in his fine edition of Homer in 1711.

ALAMODALITY, in a general ſenſe, is the accommodating a perſon's behaviour, dreſs, and actions, to the prevailing taſte of the country or times in which he lives.

ALAMODALITY of writing, is defined the accommodation of mental productions, both as to the choice of ſubject and the manner of treating it, to the genius or taſte of the times, in order to render them more acceptable to the readers.

ALAMODE, a phraſe originally French, importing a thing to be in the faſhion or mode. The phraſe has been adopted not only into ſeveral of the living languages, as the Engliſh and High-Dutch, but ſome have even taken it into the Latin. Hence we meet with *Alamodicus* and *Alamodalitas.*

ALAMODE, in commerce, a thin gloſſy black ſilk, chiefly uſed for womens hoods and mens mourning ſcarfs.

ALAMOS (Balthaſar), a Spaniſh writer, born at Medina del Campo in Caſtile. After having ſtudied the law at Salamanca, he entered into the ſervice of Anthony Perez, ſecretary of ſtate under Philip II. He was in high eſteem and confidence with his maſter, upon which account he was impriſoned after the diſgrace of this miniſter. He was kept in confinement 11 years, when Philip III. coming to the throne, ſet him at liberty, according to the orders given by his father in his will. Alamos continued in a private capacity, till the duke of Olivarez, the favourite of Philip IV. called him to public employments. He was a man of wit as well as judgment, but his pen was ſuperior to his tongue. He died in the 88th year of his age. His Spaniſh tranſlation of Tacitus, and the aphoriſms which he added in the margin, gained him great reputation. This work was publiſhed at Madrid in 1614; and was to have been followed, as mentioned in the king's privilege, with a commentary, which however has never yet appeared. The author compoſed the whole during his impriſonment.

ALAN (Cardinal William), was born at Roſſal in Lancaſhire, in the year 1532. He went to Oxford at the age of 15, and in 1550 was elected fellow of Oriel college. In 1556, being then only 24 years old, he was choſen principal of St Mary's hall, and one of the proctors of the univerſity. In 1558 he was made canon of York; but, upon queen Elizabeth's acceſſion to the throne, he left England, and ſettled at Louvain in an Engliſh college, of which he became the chief ſupport. In 1565 he viſited his native country; but, on account of his extreme activity in the propagation of the Roman Catholic religion, he was obliged to fly the kingdom in 1568. He went firſt to Mechlin, and then to Doway, where he was made doctor of divinity. Soon after, he was appointed canon of Cambray, and then canon of Rheims. He was created cardinal on the 28th of July 1587, by the title of *St Martin in Montibus;* and obtained from the king of Spain a rich abbey in the kingdom of Naples, and afterwards the biſhoprick of Mechlin. It is ſuppoſed to have been by the advice and inſtigation of this prieſt, that Philip II. attempted to invade England. He died on the 20th of October 1594, aged 63; and was buried in the Engliſh college at Rome. He was a man of conſiderable learning, and an elegant writer. He wrote many books in defence of the Romiſh religion. The moſt remarkable are, 1. *A defence of the 12 martyrs in one year.* Tho. Alfield was hanged for bringing, and publiſhing, this and other of Alan's works, into England, in the year 1584. 2. *A declaration of the ſentence of Sextus V.* &c. A work intended to explain the pope's bull for the excommunication of queen Elizabeth, and to exhort the people of England to take up arms in favour of the Spaniards. Many thouſand copies of this book, printed at Antwerp, were put on board the Armada; but the enterpriſe failing, they were afterwards deſtroyed. 3. *Of the worſhip due to ſaints and their relicts,* 1583. This treatiſe was anſwered by Lord Burleigh, and is eſteemed the moſt elegant of the Cardinal's writings.

ALAND, an iſland of the Baltic ſea, between Sweden and Finland, ſubject to the former. It lies between 17 and 19 degrees of E. Long. and between 59 and 61 degrees of Lat. at the entrance of the gulph of Bothnia.

ALARAF, in the Mahometan theology, the partition wall that ſeparates heaven from hell. The word is plural, and properly written *al araf:* in the ſingular it is written *al arf.* It is derived from the Arabic verb *arafa,* to diſtinguiſh. Al araf gives the denomination to the ſeventh chapter of the alcoran, wherein mention is made of this wall. Mahomet ſeems to have copied his al araf, either from the great gulf of ſeparation mentioned in the New Teſtament, or from the Jewiſh writers, who alſo ſpeak of a thin wall dividing heaven from hell. Mahometan writers differ extremely as to the perſons who are to be found on al araf. Some take it for a ſort of limbus for the patriarchs, prophets, &c. others place here ſuch whoſe good and evil works ſo exactly balance each other, that they deſerve neither reward nor puniſhment. Others imagine this intermediate ſpace to be poſſeſſed by thoſe who, going to war without their parents leave, and ſuffering martyrdom there, are excluded paradiſe for their diſobedience, yet eſcape hell becauſe they are martyrs.

ALARBES, a name given to thoſe Arabians who live in tents, and diſtinguiſh themſelves by their dreſs from the others who live in towns.

ALARES, in Roman antiquity, an epithet given to the cavalry, on account of their being placed in the two wings of the army.

ALARIC, a famous general of the Goths. He entered Thrace at the head of 200,000 men, and laid waſte all the country through which he paſſed. He marched next to Macedonia and Theſſaly: the Theſſalians met him near the mouth of the river Peneas, and killed about 3000 of his army; nevertheleſs he advanced into Greece, and after having ravaged the whole country, returned to Epirus, loaded with immenſe ſpoils: after ſtaying here five years, he reſolved to turn his arms to the weſt. He marched through Pannonia; and, finding little reſiſtance, entered Italy, under the conſulſhip of Stilicho and Aurelianus, A. D. 400. After various battles and treaties, he at laſt took Rome by treachery, and permitted his ſoldiers to plunder it; this happened A. D. 409. Alaric, having laid waſte a great part of Italy, intended to paſs into Sicily; but a ſtorm obliging him to land again, he beſieged the city of Coſenza; and having taken it, he died there in 411, eleven years after he firſt entered Italy.

ALARM, in the military art, denotes either the apprehenſion of being ſuddenly attacked; or the notice thereof, ſignified by firing a cannon, firelock, or the like. Falſe alarms are frequently made uſe of, to haraſs the enemy, by keeping them conſtantly under arms. Sometimes alſo this method is taken to try the vigilance of the piquet-guard, and what might be expected from them in caſe of real danger.

ALARM-Bell, that rung upon any ſudden emergency, as a fire, mutiny, or the like.

ALARM-Poſt, or *ALARM-place,* the ground for drawing up each regiment in caſe of an alarm. This is otherwiſe called *the rendezvous.*

ALARM, in fencing, is the ſame with what is otherwiſe called an appeal, or challenge.

ALASCANI, in church-hiſtory, a ſect of Antilutherans,

therans, whoſe diſtinguiſhing tenet, beſides their denying baptiſm, is ſaid to have been this, that the words, *This is my body*, in the inſtitution of the euchariſt, are not to be underſtood of the bread, but of the whole action, or celebration of the ſupper. They are ſaid to have taken the name from one Joannes a Laſco, a Poliſh baron, ſuperintendant of the church of that country, in England. *See the next article.*

ALASCO (John), a Poliſh nobleman of the 16th century, who, imbibing the reformed opinions, was expelled his country, and became preacher to a Proteſtant congregation at Embden; but foreſeeing perſecution there, went to England about the year 1551, while the reformation was carrying on under Edward the VI. The publication of the Interim driving the Proteſtants to ſuch places as afforded them toleration, 380 were naturaliſed in England, and obtained a charter of incorporation, by which they were erected into an eccleſiaſtical eſtabliſhment, independent on the church of England. The Auguſtine friars church was granted them, with the revenues, for the maintenance of Alaſco as ſuperintendant, with four aſſiſtant miniſters, who were to be approved by the king: and this congregation lived undiſturbed until the acceſſion of Queen Mary, when they were all ſent away. They were kindly received and permitted to ſettle at Embden; and Alaſco at laſt, after an abſence of 20 years, by the favour of Sigiſmund, returned to his own country, where he died in 1560. Alaſco was much eſteemed by Eraſmus, and the hiſtorians of his time ſpeak greatly in his praiſe: we have of his writing, *De Cœna Domini liber; Epiſtola continens ſummam Controverſiæ de Cœna Domini, &c.* He had ſome particular tenets, and his followers are called *Alaſcani* in church-hiſtory.

ALATAMAHA, a large river of North America, which, riſing in the Apalachian mountains, runs ſouth-eaſt through the ſtate of Georgia, and falls into the Atlantic ocean, below the town of Frederica.

ALATERNUS, in botany, the trivial name of a ſpecies of the rhamnus. See RHAMNUS.

ALAVA, a diſtrict of Spain, about 20 miles in length, and 17 in breadth, containing very good iron mines. Victoria is the capital town.

ALAUDA, or LARK, in ornithology, a genus of birds of the order of paſſeres; the characters of which are theſe: The beak is cylindrical, ſubulated, ſtraight; and the two mandibles or chaps are of equal ſize. The tongue is bifid, and the hinder claw is ſtraight, and longer than the toe. There are 28 ſpecies of the alauda, of which the following are the moſt remarkable. 1. The arvenſis, or common ſky-lark. This and the wood-lark are the only birds that ſing as they fly: this raiſing its note as it ſoars, and lowering it till it quite dies away as it deſcends. It will often ſoar to ſuch a height, that we are charmed with the muſic when we loſe ſight of the ſongſter; it alſo begins its ſong before the earlieſt dawn. Milton, in his Allegro, moſt beautifully expreſſes theſe circumſtances; and biſhop Newton obſerves, that the beautiful ſcene that Milton exhibits of rural cheerfulneſs, at the ſame time gives us a fine picture of the regularity of his life, and the innocency of his own mind: thus he deſcribes himſelf as in a ſituation

> To hear the lark begin his flight,
> And ſinging ſtartle the dull night,
> From his watch-tow'r in the ſkies,
> Till the dappled dawn doth riſe.

It continues its harmony ſeveral months, beginning early in the ſpring, on pairing. In the winter they aſſemble in vaſt flocks, grow very fat, and are taken in great numbers for the table. They build their neſt on the ground, beneath ſome clod, forming it of hay, dry fibres, &c. and lay four or five eggs. Theſe birds are taken in great quantities, in the neighbourhood of Dunſtable, in England: the ſeaſon begins about the 14th of September, and ends the 25th of February; and during that ſpace, about 4000 dozen are caught, which ſupply the markets of the metropolis of that kingdom. See BIRD-*Catching*. Vaſtly greater numbers than the above, however, are at times caught in different parts of Germany, where there is an exciſe upon them. Keyſler ſays, that the exciſe alone produces 6000 dollars every year to the city of Leipſic; whoſe larks are famous all over Germany, as having the moſt delicate flavour. But it is not at Leipſic only that they are taken in ſuch numbers: they are alſo taken in the country about Naumburg, Merſeburg, Halle, and other parts.—2. The pratenſis, or tit-lark, has the two outward feathers of the wing edged with white, and frequents the meadows. It is found frequently in low marſhy grounds. Like other larks, it builds its neſt among the graſs, and lays five or ſix eggs. Like the wood-lark, it ſits on trees; and has a moſt remarkable fine note, ſinging in all ſituations, on trees, on the ground, while it is ſporting in the air, and particularly in its deſcent. This bird, with many others, ſuch as the thruſh, black-bird, willow-wren, &c. become ſilent about midſummer, and reſume their notes in September: hence the interval is the moſt mute of the year's three vocal ſeaſons, ſpring, ſummer, and autumn. Perhaps the birds are induced to ſing again as the autumnal temperament reſembles the vernal.—3. The arborea, or wood-lark, is a native of Europe, and is diſtinguiſhed by an annular white fillet about the head. It is inferior in ſize to the ſky-lark, and is of a ſhorter thicker form; the colours are paler, and its note is leſs ſonorous and leſs varied, though not leſs ſweet. It perches on trees, and whiſtles like the black-bird. It will ſing in the night; and, like the common lark, will ſing as it flies. It builds on the ground, and makes its neſt on the outſide with moſs, within of dried bents, lined with a few hairs. It lays five eggs, duſky and blotched with deep brown marks, darkeſt at the thicker end. The males of this and the laſt are known from the females by their ſuperior ſize. But this ſpecies is not near ſo numerous as that of the common kind.—4. The campeſtris, has one half of its chief feathers of the wings brown, except two in the middle which are white, and the throat and breaſt are yellowiſh.—5. The trivialis, whoſe chief feathers on the tail are brown, only half of the outermoſt is white, and the ſecond is white at the end, in the ſhape of a wedge; there is likewiſe a double whitiſh line on the wings. It is a native of Sweden, and perches on the top of trees.—6. The criſtata: the chief tail-feathers are black, but the two outermoſt are edged with white, and the head is cruſted. It is a native of Europe. It ſings well, like the ſky-lark; lays four or five eggs, and is ſaid to hatch twice in a year.—7. The ſpinoletta: the chief tail-feathers are black, only the outermoſt two are obliquely half white. It is a native of Italy.—8. The alpeſtris: the chief wing-feathers are half white, the throat yellow, and it has a black ſtreak under the eyes and on the breaſt. It inhabits North America, where it is migratory. It viſits the neighbourhood of Albany the beginning of May, but goes farther north to breed. In winter it comes in vaſt flocks into Virginia and Carolina, returning north in ſpring. It feeds, during its ſtay in the more ſouthern parts, on oats and other grain; and while at Albany, on the graſs and the buds of ſprig-birch. It runs into holes; whence the natives of theſe laſt parts have given it the name of *chi-chup-pi-ſue*. The Engliſh call it the *ortálon*, and reckon it delicious eating. By ſome it is called *ſnow bird*, as being very plenty in that ſeaſon. It is frequently caught in great numbers by means of horſe-hair ſpringes placed in ſome bare place, the ſnow being ſcraped away, and a little chaff ſtrewed about. It is always ſeen on the ground, and has little or no ſong. This bird is not peculiar to North America: we hear of it in Germany alſo; and is in plenty throughout Ruſſia and Siberia, going northward in ſpring.—2. The magna, is yellow on the belly, with a crooked black ſtreak on the breaſt, and the three ſide-feathers of the tail white. It is a native of Africa and America.—10. The New Zealand lark (Plate XVIII.) is ſeven and a half inches in length: the bill is half an inch, of a pale aſh-colour, with the upper part black: the upper parts of the body are duſky, edged with pale aſh-colour: the breaſt and belly are white: the legs reddiſh aſh-colour, and the claws black. It inhabits Charlotte Sound, and is called *kogoo aroúre*.

ALAUTA, a conſiderable river of Turkey in Europe, which, after watering the north-eaſt part of Tranſylvania and part of Wallachia, falls into the Danube almoſt oppoſite to Nicopolis.

ALAY, ſignifying in the Turkiſh language "The Triumph," a ceremony which accompanies the aſſembling together the forces of that vaſt empire upon the breaking out of a war. It conſiſts of the moſt inſipid buffoonery, and is attended with acts of the moſt ſhocking barbarity. That which took place upon occaſion of the late war between the Porte and Ruſſia is deſcribed by Baron Tott in his memoirs as follows.

"It conſiſts in a kind of maſquerade, in which each trade ſucceſſively preſents to the ſpectators the mechanical exerciſe of its reſpective art. The labourer draws his plough, the weaver handles his ſhuttle, the joiner his plane; and theſe different characters, ſeated in cars richly ornamented, commence the proceſſion, and precede the ſtandard of Mahomet, when it is brought out of the ſeraglio to be carried to the army, in order to inſure victory to the Ottoman troops.

"This banner of the Turks, which they name *Sandjak-Cheriff*, or The Standard of the Prophet, is ſo revered among them, that, notwithſtanding its reputation has been ſo often tarniſhed, it ſtill retains their implicit confidence, and is the ſacred ſignal unto which they rally. Every thing proclaims its ſanctity. None but the emirs are allowed to touch it; they are its guards, and it is carried by their chief. The Muſſulmen alone are permitted to look upon it. If touched by other hands, it would be defiled; if ſeen by other eyes, profaned. In ſhort, it is encompaſſed by the moſt barbarous fanaticiſm.

"A long peace had unfortunately cauſed the ridiculouſneſs, and eſpecially the danger, of this ceremony to be forgotten. The Chriſtians imprudently crowded to ſee it; and the Turks, who, by the ſituation of their houſes, could make money of their windows, began to profit by the advantage; when an emir, who preceded the banner, proclaimed with a loud voice, 'Let no infidel dare to profane with his preſence the holy ſtandard of the prophet; and let every Muſſulman who perceives an unbeliever make it known under pain of reprobation.'

"From that moment no aſylum was to be found; even thoſe became informers, who, by letting out their houſes, had rendered themſelves accomplices in the crime. A religious fury ſeized on every mind, and put arms in every hand; the more atrocious the cruelty, the more was it meritorious. No regard was paid to ſex or age; pregnant women, dragged by the hair, and trodden under feet by the multitude, periſhed in the moſt deplorable manner. Nothing was reſpected by theſe monſters; and under ſuch auſpices the Turks commenced the war."

ALB, or ALBE, in the Romiſh church, a veſtment of white linen hanging down to the feet, and anſwering to the ſurplice of the Engliſh clergy. In the ancient church, it was uſual, with thoſe newly baptized, to wear an alb, or white veſtment; and hence the Sunday after Eaſter was called *dominica in albis*, on account of the albs worn by thoſe baptized on eaſter-day.

ALB is alſo a name of a Turkiſh coin, otherwiſe called *aſper*. See ASPER.

ALBA (anc. geog.), a town of the Marſi in Italy, ſituated on the north-ſide of the Lacus Fucinus, ſtill retaining its name. It ſtands upon an eminence, and is noted in Roman hiſtory for being the ſtate priſon where captive princes were ſhut up, after being barbarouſly dragged through the ſtreets of Rome at the chariot wheels of a triumphant conſul. Perſes king of Macedon terminated his wretched career in this confinement, with his ſon, the laſt hope of an illuſtrious line of kings. Syphax the Numidian, and Bituinus king of the Averni, were alſo condemned to this gaol by the particular clemency of the ſenate, which ſometimes indulged its ſavage diſpoſition by putting its captives to death.

Alba being ſituated in the centre of Italy, amidſt difficult mountainous paſſes, and far from all means of eſcape, was eſteemed a moſt proper place for the purpoſe of guarding priſoners of importance. Artificial ſtrength was added to its natural ſecurity by fortifications, which remain to this day in a ſtate that proves their ancient ſolidity. For the entertainment of the garriſon, which was required in a place of ſuch conſequence, an amphitheatre was erected, of which the ruins are ſtill valuable, as well as the foundations of a temple, and other buildings of Roman times.

Lucius Vitellius, brother to the emperor of that name, had a villa near this place, famous for the variety and excellence of its fruit-trees, which he had brought from Syria. His gardens were the nurſeries where ſeveral of the moſt delicious ſtone-fruits, that are now ſo common in Europe, were firſt cultivated and multiplied.

It muſt have been neceſſary at Alba to ſhelter trees tranſplanted from Aſia, and to treat them with great tenderneſs and care, in order to rear them to perfection: for the climate of this high region is extremely rigorous in winter; the cold ſeaſon laſts long, and is accompanied with violent ſtorms of wind and falls of ſnow. The lake has been often frozen entirely over.

ALBA Firma, or *Album*, in old cuſtoms, denoted rent paid in ſilver, and not in corn, which was called *black-mail*.

ALBA Terra, one of the numerous names for the philoſopher's ſtone.

ALBA Regalis. See STULL WEISSENBURGH.

ALBA Helviorum, or *Albauguſta*, (anc. geog.), afterwards called *Vivarium*, now *Viviers*, in the ſouth-eaſt of Languedoc, on the Rhone. In the lower age the inhabitants were called *Albenſes*, and their city *Civitas Albenſium*, in the Notitia Galliæ. E. Long. 4. 45. Lat. 44. 50.

ALBA Julia (anc. geog.), now *Weiſſenburg*, a town of Tranſylvania, on the river Mariſius, or Meriſch, to the weſt of Hermanſtat, ſuppoſed to be called *Alba Julia*, after Julia Domna the mother of Caracalla. There are, however, ſeveral inſcriptions found at or near Weiſſenburg, which bear COL. APUL. that is *Colonia Apulenſis*, without the leaſt mention of *Alba Julia*, though inſcribed after Caracalla's time. Add, that Ulpian, reciting the colonies of Dacia, calls this colony *Apulenſis*, and neither *Alba* nor *Julia*. Whence there is a ſuſpicion, that *Alba Julia* is a corruption of *Apulum*. It was alſo called *Apulum Auguſtum*. E. Long. 25. 0. Lat. 46. 46.

ALBA Longa (anc. geog.), a colony from Lavinium, in Latium, eſtabliſhed by Aſcanius the ſon of Æneas, at the foot of the Mons Albanus: called *Alba*, from a white ſow found by Æneas, which farrowed 30 white pigs on that ſpot; which circumſtance was interpreted to portend the building of a city there in 30 years after (Propertius). The epithet *Longa* was added on account of its length. It was the royal reſidence till the building of Rome, as was foretold by Anchiſes (Virgil); was deſtroyed by Tullius Hoſtilius, all but the fane or temple; and the inhabitants were tranſplanted to Rome (Strabo).

ALBA Pompeia (anc. geog.), on the river Ceba, now *Ceva*, in Liguria, the birth-place of the emperor Pertinax; a colony either eſtabliſhed at firſt by Pompey, or re-eſtabliſhed by him after having been before ſettled by Scipio. The inhabitants were called *Alpenſes Pompeiani*. At this day the town is ſimply called *Alba*, without any epithet.

ALBAHURIM, *figura ſexdecim laterum*, a figure of great importance according to aſtrological phyſicians, who build their prognoſtics on it.

ALBAN (St) is ſaid to have been the firſt perſon who ſuffered martyrdom for Chriſtianity in Britain; he is therefore uſually ſtyled the protomartyr of that iſland. He was born at Verulam, and flouriſhed towards the end of the third century. In his youth he took a journey to Rome, in company with Amphibalus a monk of Caerleon, and ſerved ſeven years as a ſoldier under the emperor Diocleſian. At his return home, he ſettled in Verulam; and, through the example and inſtructions of Amphibalus, renounced the errors of paganiſm, in which he had been educated, and became a convert to the Chriſtian religion. It is generally agreed, that Alban ſuffered martyrdom during the great perſecution under the reign of Diocleſian; but authors differ as to the year when it happened: Bede and others fix it in 286; ſome refer it to the year 296; but Uſſerius reckons it amongſt the events of 303. The ſtory and circumſtances relating to his martyrdom, according to Bede, are as follows. Being yet a pagan (or at leaſt it not being known that he was a Chriſtian), he entertained Amphibalus in his houſe. The Roman governor being informed thereof, ſent a party of ſoldiers to apprehend Amphibalus; but Alban, putting on the habit of his gueſt, preſented himſelf in his ſtead, and was carried before that magiſtrate. The governor having aſked him of what family he was? Alban replied, "To what purpoſe do you inquire of my family? if you would know my religion, I am a Chriſtian." Then being aſked his name, he anſwered, "My name is Alban; and I worſhip the only true and living God, who created all things." The magiſtrate replied, "If you would enjoy the happineſs of eternal life, delay not to ſacrifice to the great gods." Alban anſwered, "The ſacrifices you offer are made to devils; neither can they help the needy, nor grant the petitions of their votaries." His behaviour ſo enraged the governor, that he ordered him immediately to be beheaded. In his way to execution, he was ſtopped by a river, over which was a bridge ſo thronged with ſpectators that it was impoſſible to croſs it; the ſaint, as we are told, lifted up his eyes to heaven, and the ſtream was miraculouſly divided, and afforded a paſſage for himſelf and a thouſand more perſons. Bede does not indeed give us the name of this river; but, notwithſtanding this omiſſion, the miracle, we ſuppoſe, will not be the leſs believed. This wonderful event converted the executioner upon the ſpot, who threw away his drawn ſword, and, falling at St Alban's feet, deſired he might have the honour to die with him. This ſudden converſion of the headſman occaſioning a delay in the execution till another perſon could be got to perform the office, St Alban walked up to a neighbouring hill, where he prayed for water to quench his thirſt, and a fountain of water ſprung up under his feet: here he was beheaded, on the 23d of June. The executioner is ſaid to have been a ſignal example of divine vengeance; for as ſoon as he gave the fatal ſtroke, his eyes dropt out of his head. We may ſee the opinion of Mr Milton in regard to this narrative, in his Hiſtory of England. His words are theſe, ſpeaking of St Alban, "The ſtory of whoſe martyrdom, ſoiled and worſe martyred with the fabling zeal of ſome idle fancies, more fond of miracles than apprehenſive of the truth, deſerves no longer digreſſion." Between 4 or 500 years after St Alban's death, Offa, king of the Mercians, built a very large and ſtately monaſtery to his memory; and the town of St Albans in Hertfordſhire takes its name from that protomartyr.

ALBANA (anc. geog.), a ſea-port town of Albania, on the Caſpian ſea, between the rivers Caſius and Albanus; now called *Bachu*, or *Bachy*, giving name to the Caſpian ſea, viz. *Mar de Bahu*. E. Long. 49. 0. Lat. 40. 0.

ALBANENSES, in church-hiſtory, the ſame with Albigenſes, according to ſome; according to others, different. Theſe, however, who are for diſtinguiſhing them, attribute the ſame opinions to both; only making the Albanenſes to have been prior in reſpect of time, as having been found towards the cloſe of the eighth century; whereas the Albigenſes appeared not till the twelfth. See ALBIGENSES.

ALBANI, in Roman antiquity, a college of the *ſalii*, or prieſts of Mars; ſo called from mount Albanus, the place of their reſidence. See SALII.

ALBANI (Francis), a celebrated painter, born in Bologna, March 17, 1578. His father was a ſilk merchant, and intended to bring up his ſon to that buſineſs; but Albani having a ſtrong inclination to painting, when his father died, devoted himſelf entirely to that art, though then but twelve years of age. He firſt ſtudied under Denys Calvert; Guido Rheni being at the ſame time under this maſter, with whom Albani contracted a very great friendſhip. Calvert drew but one profile for Albani and afterwards left him entirely to the care of Guido; under whom he made great improvement, his fellow-diſciple inſtructing him with the utmoſt humanity and good humour. He followed Guido to the ſchool of the Caraches: but a little after their friendſhip for each other began to cool; which was owing perhaps to the pride of Albani, who could not bear to ſee Guido ſurpaſs him, or to the jealouſy of Guido at finding Albani make ſo ſwift a progreſs. They certainly endeavoured to eclipſe one another; for when Guido had ſet up a beautiful altar-piece, Albani would oppoſe to it ſome fine picture of his: thus did they behave for ſome time, and yet ſpake of each other with the higheſt eſteem. Albani, after having greatly improved himſelf under the Caraches, went to Rome, where he continued many years, and married in that city; but his wife dying in childbed, at the earneſt requeſt of his relations he returned to Bologna, where he entered again into the ſtate of matrimony. His ſecond wife (Doralice) was well deſcended, but had very little fortune; which he perfectly diſregarded, ſo ſtrongly was he captivated with her beauty and good ſenſe. Albani, beſides the ſatisfaction of poſſeſſing an accompliſhed wife, reaped likewiſe the advantage of having a moſt beautiful model; ſo that he had now no occaſion to make uſe of any other woman to paint a Venus, the Graces, Nymphs, and other deities, whom he took a particular delight in repreſenting. His wife anſwered this purpoſe admirably well; for beſides her bloom of youth, and the beauty of her perſon, he diſcovered in her ſo much modeſty, ſo many graces and perfections, ſo well adapted to painting, that it was impoſſible for him to meet with a more finiſhed woman. She afterwards brought him ſeveral boys, all extremely beautiful and finely proportioned; ſo that ſhe and her children were the originals of his moſt agreeable and graceful compoſitions. Doralice was ſo conformable to his intentions, that ſhe took a pleaſure in ſetting the children in different attitudes, holding them naked, and ſometimes ſuſpended by ſtrings, when Albani would draw them in a thouſand different ways. It was from them, too, that the famous ſculptors Flamand and Argaldi modelled their little cupids.

Albani was of a happy temper and diſpoſition; his paintings, ſays Malvaſia, breathing nothing but content and joy. Happy in a force of mind that conquered every uneaſineſs, his poetical pencil carried him through the moſt agreeable gardens to Paphos and Citheria: thoſe delightful ſcenes brought him over the lofty Parnaſſus to the delicious abodes of Apollo and the Muſes; whence what Du Freſnoy ſays of the famous Giulio Romano may be juſtly applied to Albani:

> Taught from a child in the bright muſes' grots,
> He open'd all the treaſures of Parnaſſus,
> And in the lovely poetry of painting
> The myſt'ries of Apollo has reveal'd.

He died the 4th of October 1660, to the great grief of all his friends and the whole city of Bologna. Malvaſia has preſerved ſome verſes of Franciſco de Lemene intended for his monument; the ſenſe whereof is, "That the mortal remains of the illuſtrious Albani, he who gave life to ſhade, lie interred in this tomb: the earth never produced ſo wonderful an artiſt, or a hand equal to his immortal one; which gave colours to the ſoul, and a ſoul to colours. Prometheus animated clay, and gave life by means of the ſun; but Albani animated merely by the aſſiſtance of ſhade." He was very famous in his lifetime, and had been viſited by the greateſt painters. Several princes honoured him with letters; and amongſt the reſt King Charles I. who invited him to England by a letter ſigned with his own hand.

ALBANIA, a province of Turky in Europe, on the gulph of Venice, bounded by Livadia on the ſouth, by Theſſaly and Macedonia on the eaſt, and on the north by Boſnia and Dalmatia. The people are ſtrong, large, courageous, and good horſemen; but are ſaid to be of a thieviſh diſpoſition: the grand ſeignior procures excellent ſoldiers from hence, particularly cavalry, known by the name of *Arnauts*. There are ſeveral large towns in this province; and the inhabitants are almoſt all Chriſtians of the Greek church, and deſcended from the ancient Scythians. Formerly it was part of the kingdom of Macedonia. Their chief manufacture is carpets. The principal places are Durazzo, Velona, Antivari, Scutari, Croya, Aleſſo, Dibra, Dolcigno, and Albanapoli. Long. from 28° to 31° E. Lat. from 39° to 43° N.

ALBANIA, a country of Aſia, bounded on the weſt by Iberia; on the eaſt by the Caſpian ſea; on the north by mount Caucaſus; on the ſouth by Armenia and the river Cyrus, now Kur; which, ſpringing from the Moſchian mountains that ſeparate Colchis from Armenia, and watering the country of Mokan, receives the Aragus and Araxes, and falls into the Caſpian ſea within a ſmall diſtance from the ſouthern borders of this country.—The whole country formerly called *Albania*, now goes under the names of *Shirwan* and *Eaſt-Georgia*, and is extremely fruitful and pleaſant. The ancient hiſtorians take notice of the Albanian men being tall, ſtrong-bodied, and, generally ſpeaking, of a very graceful appearance; far excelling all other nations in comelineſs as well as ſtature. Modern travellers take no notice of the appearance of the men; but extol the beauty of the women, which ſeems to be unnoticed by the ancients. The Albanians were anciently an independent and pretty powerful people; but we find no mention made of their kings till the reign of Alexander the Great, to whom the king of Albania is ſaid to have preſented a dog of an extraordinary fierceneſs and ſize.—It does not appear that the Albanians were ever conquered by the Romans, even when their power was at its greateſt height; though, when they ventured to engage in war with that powerful empire, they were always defeated, as might naturally be expected.

ALBANO, a town of Italy, on a lake of the ſame name, in the Campagnio of Rome. It was called by the ancients *Albanum Pompeii*, and built out of the ruins of the ancient Alba Longa, which was deſtroyed by Tullus Hoſtilius. It ſtands within twelve miles ſouth-eaſt of Rome, and for the pleaſantneſs of its ſituation is the ſummer retirement of a great many Roman princes. It is likewiſe the ſee of a biſhop, who is one of the ſix ſenior cardinals. The town is famous for its excellent wine, and the ruins of a mauſoleum, which, according to the tradition of the inhabitants, was made for Aſcanius. The proſpect from the garden of the Capuchins is extremely pleaſant, taking in the Campania of Rome, and terminating in a full view of the Tuſcan ſea. Cloſe by the town lies the Alban lake, of an oval figure, and about ſeven miles in circumference, which, by reaſon of the high mountains round it, looks like the area of a great amphitheatre. It abounds with excellent fiſh, and over againſt the hermitage it is ſaid to be unfathomable. The mountain of Albano is called *Monte Cavo*, on the top of which was a celebrated temple dedicated to Jupiter and Juno. Near the Capuchins there is another convent of Franciſcans: and not far from thence the palace of Cardinal Barbarini, remarkable for very pleaſant gardens, with the ruins of ancient baths, and ſeveral old fragments of Moſaic work. E. Long. 13. 10. N. Lat. 41. 43.

There is likewiſe another town of the ſame name in the Baſilicate of the kingdom of Naples, remarkable for the fertility of the ſurrounding territory, and for the nobility of the inhabitants.

ALBANS (St), a market-town of Hertfordſhire, is a very great thoroughfare, accommodated with good inns, on the north-weſt road from London, at the diſtance of 21 miles. This town ſends two members to parliament, gives the title of *duke* to the noble family of Beauclerc, and has one of the beſt markets for wheat in England. St. Albans is ſeated near the ruins of an ancient Roman city, by Tacitus called *Verolam*; and by the Saxons *Watlingceſter*, becauſe it is ſeated on the road called *Watlingſtreet*. Nothing now remains of Verolam but the ruins of old walls; in the fields adjacent to which they continue to find Roman coins, as they formerly found teſſellated pavements. In memory of St Alban, Offa, king of the Mercians, *anno* 795, erected an abbey, calling it *St Albans*; and near it the town of the ſame name was afterwards built. The church of the abbey is remaining to this day: time and the weather have made it look like ſtone on the outſide; but if you break a bit off, the redneſs of the brick immediately appears. When the monaſteries were diſſolved, the townſmen paid L.400 to prevent its being levelled with the ground, and have ſince converted it into a pariſh-church, which, for its largeneſs, beauty, and antiquity, claims a particular regard. It had a very noble font of ſolid braſs, in which the children of the kings of Scotland were uſed to be baptized; and was brought from Edinburgh, by Sir Philip Lea, when that city was in flames; but in the times of the late civil wars, it was taken away. Not many years ſince, a tomb was diſcovered in this church, ſaid to be that of Humphrey Duke of Glouceſter: when the leaden coffin was opened, the body was pretty entire, being preſerved in a ſort of pickle. There was a ſtately croſs in the middle of the town, as there were in many other places where queen Eleanor's body reſted when it was brought out of the north for interment at Weſtminſter; but it has been demoliſhed, as ſome ſay, by the inhabitants. The market-days are Wedneſdays and Saturdays, W. Long. 0. 12. N. Lat. 51. 44.

ALBANUS MONS (anc. geog.), now called *Mont Albano*, 16 miles from Rome, near where Alba Longa ſtood.

ALBANUS MONS (anc. geog.), to the north of Iſtria, called *Albius* by Strabo; the extremity of the Alps, which, together with the mountains to the eaſt, joining it, called *Montes Bebii*, ſeparates the farther Liburnia and Dalmatia from Pannonia.

ALBANY, a city of North America, in the ſtate of New-York, ſituated upon the weſt ſide of Hudſon's river, 160 miles north of the city of New-York. It contains about 4000 inhabitants, collected from almoſt all parts of the northern world. The houſes are built in the old Dutch Gothic ſtile, with the gable end to the ſtreet, and are ſeldom more than one ſtory and an half high: they are by no means elegant, but are kept very clean. Albany, from its being ſeated on a fine river, at the head of ſloop navigation, ſurrounded with a rich and extenſive back country, and the ſtore-houſe of the trade to and from Canada, is in a flouriſhing condition. It has of late, however, had a formidable rival in the new city of Hudſon. W. Long. 44. 29. N. Lat. 42. 36.

ALBARAZIN, a ſtrong town, and one of the moſt ancient of the kingdom of Arragon in Spain. It is ſeated upon an eminence, near the river Gaudalquivir, a little below its ſource, and on the frontiers of Valencia and New Caſtile. It is the ſeat of a biſhop, and produces the beſt wool in all Arragon. It is about 100 miles eaſt of Madrid. E. Long. 2. 10. N. Lat. 40. 32.

ALBARII, in antiquity, properly denoted thoſe who gave the whitening to earthen veſſels, &c. In which ſenſe they ſtood contradiſtinguiſhed from *Dealbatores*, who whitened walls.

ALBARIUM OPUS, in the ancient building, the incruſtation or covering of the roofs of houſes with white plaſter, made of mere lime. This is otherwiſe called *opus album*. It differs from *Tectorium*, which is a common name given to all roofing or ceiling, including even that formed of lime and ſand, or lime and marble; whereas *albarium* was reſtrained to that made of lime alone.

ALBATROSS, in ornithology, a ſpecies of the diomedea. See DIOMEDEA.

ALBAZIN, a town of Greater Tartary, with a ſtrong caſtle. It is ſituated upon the river Amur, or Yamour, and belongs to the Muſcovites. E. Long. 103. 30. N. Lat. 54. 0.

ALBE, a ſmall piece of money, current in Germany, worth only a French ſol and ſeven deniers.

ALBEMARLE, or AUMARLE, a town of France, in Upper Normandy, and in the territory of Caux from whence the noble family of Kepple takes the title of *Earl*. The ſerges of this town are in high eſteem.

It is ſeated on the declivity of a hill, on the confines of Picardy, 35 miles N. E. of Rouen, and 70 N. W. of Paris. E. Long. 2. 21. N. Lat. 49. 50.

ALBEMARLE, the moſt northern part of the ſtate of North Carolina.

ALBENGUA, a town of Italy, in the territory of Genoa. It is the ſee of a biſhop; and is a very ancient handſome town, but not well peopled on account of the inſalubrity of the air. However, it is ſeated in a very beautiful plain, which is well cultivated; and the outſide of the town is ſurrounded with olive-trees. It is a ſea-port, about 38 miles S. W. of Genoa. E. Long. 8. 13. N. Lat. 44. 4.

ALBERNUO, a kind of camblet, brought from the Levant by the way of Marſeilles.

ALBERONI (Julius), the ſon of a poor gardener in the ſuburbs of Placentia, born in 1664; who, by his great abilities and good fortune, roſe from this low original, to the employment of firſt miniſter of ſtate at the court of Spain, and to the dignity of cardinal. He rouſed that kingdom out of the lethargy it had ſunk into for a century paſt; awakened the attention, and raiſed the aſtoniſhment, of all Europe, by his projects; one of which was to ſet the Pretender on the throne of Great Britain. He was at length deprived of his employment, and baniſhed to Rome. He died in 1752, at the great age of 89. His *Teſtament Politique*, collected from his memoirs and letters, was publiſhed at Lauſanne in 1753.

ALBERT, Margrave of Brandenburg, and the laſt grand maſter of the Teutonic Order, laid aſide the habit of his order, embraced Lutheraniſm, and concluded a peace at Cracow in 1525, by which he was acknowledged Duke of the eaſt part of Pruſſia (formerly called for that reaſon *Ducal Pruſſia*), but to be held as a fief of Poland, and to deſcend to his male heirs. See PRUSSIA.

ALBERTI (Leone Battiſta), was deſcended from a noble family in Florence; and was perfectly acquainted with painting, ſculpture, and architecture. He wrote of all three in Latin; but his ſtudies did not permit him to leave any thing conſiderable behind him in painting. He was employed by pope Nicholas V. in his buildings, which he executed in a beautiful manner; and his work on architecture, which conſiſts of ten books, is greatly eſteemed. He alſo wrote ſome treatiſes of morality, and a piece on arithmetic. He died in 1485.

ALBERTISTS, a ſect of ſcholaſtics, ſo named from their leader Albertus Magnus.

ALBERTUS (Magnus), a Dominican friar, and afterwards biſhop of Ratiſbon, was one of the moſt learned men and moſt famous doctors of the 13th century. He is ſaid to have acted as a man-midwife; and ſome have been highly offended that one of his profeſſion ſhould follow ſuch an employment. A book intitled *De Natura Rerum*, of which he was reputed the author, gave riſe to this report. In this treatiſe there are ſeveral inſtructions for midwives, and ſo much ſkill ſhown in their art, that one would think the author could not have arrived at it without having himſelf practiſed: but the advocates for Albert ſay he was not the writer thereof, nor of that other piece *De Secretis Mulierum*; in which there are many phraſes and expreſſions unavoidable on ſuch a ſubject, which gave great offence, and raiſed a clamour againſt the ſuppoſed author. It muſt be acknowledged, however, that there are, in his Comment upon the Maſter of Sentences, ſome queſtions concerning the practice of conjugal duty, in which he has uſed ſome words rather too groſs for chaſte and delicate ears: but they allege what he himſelf uſed to ſay in his own vindication, that he came to the knowledge of ſo many monſtrous things at confeſſion, that it was impoſſible to avoid touching upon ſuch queſtions. Albert was certainly a man of a moſt curious and inquiſitive turn of mind, which gave riſe to other accuſations brought againſt him. They ſay, that he laboured to find out the philoſopher's ſtone; that he was a magician; and that he made a machine in the ſhape of a man, which was an oracle to him, and explained all the difficulties he propoſed. He had great knowledge in the mathematics, and by his ſkill in that ſcience might probably have formed a head with ſprings capable of articulating ſounds; like to the machines of Boetius, of which Caſſiodorus has ſaid, "Metals lowe; the birds of Diomedes trumpet in braſs; the brazen ſerpent hiſſes; counterfeited ſwallows chatter, and ſuch as have no proper note, from braſs ſend forth harmonious muſic." John Matthæus de Luna, in his treatiſe *De Rerum Inventoribus*, has attributed the invention of fire-arms to Albert; but in this he is confuted by Naude, in his *Apologie des Grands Hommes*. We are told, that Albert was naturally very dull, and ſo incapable of inſtruction, as to be upon the point of quitting the cloiſter, from deſpair of learning what his habit required: but that the Holy Virgin appeared to him, and aſked him in which he choſe to excel, philoſophy or divinity? that having choſen the former, ſhe aſſured him he would become incomparable therein; but that, as a puniſhment for not preferring divinity, he ſhould ſink before he died, into his former ſtupidity. It is added, that after this apparition he had an infinite deal of wit; and that he advanced in all the ſciences with ſo quick a progreſs, as utterly aſtoniſhed his maſters; but that, three years before his death, he ſtopped ſhort when reading a divinity-lecture at Cologn; and having in vain endeavoured to recal his ideas, he found that the Virgin's prediction was accompliſhed. "It would be very unneceſſary (ſays Bayle, after relating theſe particulars) to obſerve that they are fables. Thoſe who would believe me need not be told this, ſince they would judge in the ſame manner of their own accord; and as for ſuch as think otherwiſe, they would not alter their opinion by reading here that I am of a different way of thinking." Albert died at Cologn, November 15, 1280. His works were printed at Lyons, in 1651, in 21 volumes in folio.

ALBERTUS, a gold coin, worth about 14 French livres: it was coined during the adminiſtration of Albertus archduke of Auſtria.

ALBESIA, in antiquity, a kind of ſhields otherwiſe called *Decumana*. See DECUMANA.

ALBI, a city of France, the capital of the Albigeois, in Languedoc, and the ſee of an archbiſhop. The cathedral is dedicated to St Cecilia, and has one of the fineſt choirs in the kingdom. Here is a very valuable ſilver ſhrine, of exquiſite workmanſhip, of the Moſaic kind: it contains the reliques of St Clair, the firſt biſhop of this city. The chapel of this pretended

Albi, Albigenſes.

ſaint is magnificent, and adorned with paintings. The Lice is a fine large walk without the city: what diſtinguiſhes this from all others, is a terrace above a deep mall, which ſerves inſtead of a foſſe; it is bordered with two rows of very fine trees, which are kept in excellent order. There are four gates, through which you may view all the beauties of a delightful plain. At one end of this is the convent of the Dominicans. The archbiſhop's palace is very beautiful. The river waſhes its walls, and ſerves both for an ornament and defence. This city is ſeated on the river Tarn, 35 miles north-by-weſt of Toulouſe, and 250 ſouth of Paris. E. Long. 0. 52. N. Lat. 43. 56.

The Albigeois is a ſmall territory about 27 miles in length, and 20 in breadth, abounding in corn, woad, grapes, ſaffron, plums, and ſheep; and the inhabitants drive a great trade in dried prunes, grapes, a coarſe ſort of cloth, and wines of Gaillac. Theſe wines are the only ſort hereabouts that are fit for exportation: they are carried down to Bourdeaux, and generally ſold to the Britiſh. They have likewiſe ſeveral coal-mines.

ALBIGENSES, in church-hiſtory, a ſect or party of reformers, about Toulouſe and the Albigeois in Languedoc, who ſprung up in the 12th century, and diſtinguiſhed themſelves by their oppoſition to the diſcipline and ceremonies of the Romiſh church.

This ſect had their name, it is ſuppoſed, either by reaſon there were great numbers of them in the dioceſe of Albi, or becauſe they were condemned by a council held in that city. In effect, it does not appear that they were known by this name before the holding of that council. The *Albigenſes* were alſo called *Albiani*, *Albigeſii*, *Albii*, and *Albanenſes*, though ſome diſtinguiſh the laſt from them. Other names given to them are, *Henricians*, *Abelardiſts*, *Bulgarians*, &c. ſome on account of the qualities they aſſumed; others on that of the country from whence it is pretended they were derived; and others on account of perſons of note who adopted their cauſe, as Peter de Brius, Arnold de Breſſe, Abelard, Henry, &c. Berengarius, if not Wickliff himſelf, is by ſome ranked in the number. The *Albigenſes* are frequently confounded with the *Waldenſes*; from whom, however, they differ in many reſpects, both as being prior to them in point of time, as having their origin in a different country, and as being charged with divers hereſies, particularly Manicheiſm, from which the *Waldenſes* are exempt. But ſeveral Proteſtant writers have vindicated them from that imputation. Dr Allix ſhows, that a great number of *Manichees* did ſpread over the weſtern countries from Bulgaria; and ſettled in Italy, Languedoc, and other places, where they were alſo *Albigenſes*: by which means, being both under the imputation of *hereſy*, they came, either by ignorance or malice, to be confounded, and called by the ſame common name, though in reality entirely different.

Other errors imputed to them by their opponents, the monks of thoſe days, were, That they admitted two Chriſts; one evil, who appeared on earth; the other good, who has not yet appeared: That they denied the reſurrection of the body; and maintained human ſouls to be dæmons impriſoned in their bodies, by way of puniſhment for their ſins: That they condemned all the ſacraments of the church; rejected baptiſm as

Albigenſes.

uſeleſs; held the eucharist in abhorrence; excluded the uſe of confeſſions and penance; maintained marriage unlawful; laughed at purgatory, prayers for the dead, images, crucifixes, &c.—There were likewiſe ſaid to be two claſſes of them; the Perfect, and the Believers. The perfect boaſted of their living in continence, of eating neither fleſh, eggs, nor cheeſe. The believers lived like other men, and were even looſe in their morals; but they were perſuaded they ſhould be ſaved by the faith of the perfect, and that none were damned who received impoſition of hands from them. But from theſe charges alſo they are generally acquitted by Proteſtants; who conſider them as the pious inventions of the Romiſh church, whoſe members deem it meritorious by any means to blacken heretics.

However this be, the Albigenſes grew ſo formidable, that the Catholics agreed upon a holy league or croiſade againſt them. They were at firſt ſupported by Raimond, count of Toulouſe. Pope Innocent III. deſirous to put a ſtop to their progreſs, ſent a legate into their country; which failing, he ſtirred up Philip Auguſtus, king of France, and the other princes and great men of the kingdom, to make war upon them. Upon this the count of Toulouſe, who had ſided with them, made his ſubmiſſion to the pope, and went over to the Catholics: but ſoon after, finding himſelf plundered by the croiſaders, he declared war againſt them, and was joined by the king of Arragon. His army was defeated at the ſiege of Muret, where he himſelf was killed, and the defeat followed by the ſurrender of the city of Toulouſe, and the conqueſt of the greateſt part of Languedoc and Provence. His ſon Raimond ſucceeded him; who agreed with the king and the pope to ſet up the inquiſition in his eſtates and to extirpate the Albigenſes. In an aſſembly held at Milan, the archbiſhop of Toulouſe drew up articles; agreeable to which the count made a moſt ample declaration againſt them, which he publiſhed at Toulouſe in 1253. From this time the Albigenſes dwindled by little and little, till the times of the reformation; when ſuch of them as were left fell in with the Vaudois, and became conformable to the doctrine of Zuinglius and the diſciples of Geneva.

ALBIGENSES is alſo a name ſometimes given to the followers of Peter Vaud, or Waldo; and hence ſynonymous with what we more properly call *Waldenſes*, or Poor Men of Lyons. In this ſenſe the word is applied by Camerarius, Thuanus, and ſeveral other writers. The reaſon ſeems to be, that the two parties agreed in their oppoſition to the papal innovations and incroachments, though ~~in~~ divers other reſpects ſaid to be different enough. The biſhop of Meaux labours hard to ſupport a diſtinction between the two ſects, alleging that the *Albigenſes* were heretics and Manichees; whereas the *Waldenſes* were only ſchiſmatics, not heretics: being ſound as to articles of faith, and only ſeparating from the church of Rome on account of forms and diſcipline. Dr Allix endeavours to ſet aſide the diſtinction; and ſhows, that both of them held the ſame opinions, and were equally condemned and held for heretics; and this not for points of faith, but for declaiming againſt the papal tyranny and idolatry, and holding the pope to be the Antichriſt; which laſt, according to M. de Meaux, conſtitutes nothing leſs than

Manicheiſm. In this ſenſe the Lollards and Wickliffites in England were not only Albigenſes but Manichees.

ALBINTEMELIUM, ALBINTIMILIUM, (Tacitus ;) or at full length, ALBIUM INTEMELIUM, (Pliny, Strabo) ; now *Vintimiglia*, ſituated in the ſouth-weſt of the territory of Genoa, near the borders of the county of Nice, with a port on the Mediterranean, at the mouth of the rivulet Rotta, almoſt about half-way between Monaco and S. Remo. E. Long. 7. 40. Lat. 43. 17.

ALBIOECE, or ALEBECE, (Pliny, Strabo) ; otherwiſe called *Reii Apollinares*, from their ſuperſtitious worſhip of Apollo; alſo *Civitas Reienſium ;* now *Riez*, in Provence, about 18 leagues to to the north-eaſt of Toulon, on the north ſide of the rivulet Verdon ; was originally a Roman colony, (Inſcription.) It is ſometimes written *Regium*. The people were called *Albici*, (Cæſar.) E. Long. 1. 0. Lat. 43. 20.

ALBINI, in antiquity, the workmen employed in what was called *Opus Albarium*. They make a different profeſſion from the *dealbatores* or *whiteners*.

ALBINOS, the name by which the Portugueſe call the white Moors, who are looked upon by the negroes as monſters. They at a diſtance might be taken for Europeans ; but, when you come near them, their white colour appears like that of perſons affected with a leproſy.

In SAUSSURE's *Voyages dans les Alpes*, is the following account of two boys, at Chamouni, who have been called *Albinos*. " The elder, who was at the end of the year 1785 about twenty, or one-and-twenty years of age, had a dull look, with lips ſomewhat thick, but nothing elſe in his features to diſtinguiſh him from other people. The other, who is two years younger, is rather a more agreeable figure ; he is gay and ſprightly, and ſeems not to want wit. But their eyes are not blue ; the iris is of a very diſtinct roſe-colour : the pupil too, when viewed in the light, ſeems decidedly red ; which ſeems to demonſtrate, that the interior membranes are deprived of the uvea, and of that black mucus matter that ſhould line them. Their hair, their eye-brows, and eye-laſhes, the down upon their ſkin, were all, in their infancy, of the moſt perfect milk-white colour, and very fine ; but their hair is now of a reddiſh caſt, and has grown pretty ſtrong. Their ſight too is ſomewhat ſtrengthened ; though they exaggerate to ſtrangers their averſion for the light, and half-ſhut the eye-lids, to give themſelves a more extraordinary appearance. But thoſe who, like me, have ſeen them in their infancy, before they were tutored to this deceit, and when too few people came to Chamouni to make this affectation profitable to them, can atteſt that then they were not very much offended with the light of day. At that time, they were ſo little deſirous of exciting the curioſity of ſtrangers, that they hid themſelves to avoid ſuch ; and it was neceſſary to do a ſort of violence to them before they could be prevailed on to allow themſelves to be inſpected. It is alſo well known at Chamouni, that when they were of a proper age they were unable to tend the cattle like other children at the ſame age ; and that one of their uncles maintained them out of charity, at a time of life when others were capable of gaining a ſubſiſtence by their labour.

" I am therefore of opinion, that we may conſider theſe two lads as true albinos : for if they have not the thick lips and flat noſes of the white negroes, it is becauſe they are albinos of Europe, not of Africa. This infirmity affects the eyes, the complexion, and the colour of the hair ; it even diminiſhes the ſtrength, but does not alter the conformation of the features. Beſides, there are certainly in this malady various degrees : ſome may have leſs ſtrength, and be leſs able to endure the light : but theſe circumſtances in thoſe of Chamouni are marked with characters ſufficiently ſtrong to entitle them to the unhappy advantage of being claſſed with that variety of the human ſpecies denominated albinos.

" When nature preſents the ſame appearance often, and with circumſtances varied, we may at laſt diſcover ſome general law, or ſome relation which that appearance has with known cauſes : but when a fact is ſo ſingular and ſo rare, as that of thoſe albinos, it gives but little ſcope to conjectures ; and it is very difficult to verify thoſe by which we attempt to explain it.

" I at firſt imagined that this diſeaſe might be referred to a particular ſort of organic debility ; that a relaxation of the lymphatic veſſels within the eye might ſuffer the globules of the blood to enter too abundantly into the iris, the uvea, and even into the retina, which might occaſion the redneſs of the iris and of the pupil. The ſame debility ſeemed alſo to account for the intolerance of the light, and for the whiteneſs of the hair.

" But a learned phyſiologiſt, M. Blumenbach, profeſſor in the univerſity at Gottingen, who has made many profound obſervations on the organs of ſight, and has conſidered with great attention the albinos of Chamouni, attributes their infirmity to a different cauſe.

" The ſtudy of comparative anatomy has furniſhed him with frequent opportunities of obſerving this phenomenon ; he has found it in brutes, and white dogs, and in owls ; he ſays, it is generally to be ſeen in the warm-blooded animals ; but that he has never met with it in thoſe with cold blood.

" From his obſervations, he is of opinion, that the redneſs of the iris, and of the other internal parts of the eye, as well as the extreme ſenſibility that accompanies this redneſs, is owing to the total privation of that brown or blackiſh mucus, that, about the fifth week after conception, covers all the interior parts of the eye in its ſound ſtate. He obſerves, that Simon Pontius, in his treatiſe *de Coloribus Oculorum*, long ago remarked, that in blue eyes the interior membranes were leſs abundantly provided with this black mucus, and were therefore more ſenſible to the action of light. This ſenſibility of blue eyes agrees very well, ſays M. Blumenbach, with northern people, during their long twilight ; while, on the contrary, the deep black in the eyes of negroes enables them to ſupport the ſplendor of the ſun's beam in the torrid zone.

" As to the connection between this red colour of the eyes and the whiteneſs of the ſkin and hair, the ſame learned phyſiologiſt ſays, that it is owing to a ſimilarity of ſtructure, *conſenſus ex ſimilitudine fabricæ*. He aſſerts, that this black mucus is formed only in the delicate cellular ſubſtance, which has numerous blood-veſſels contiguous to it, but contains no fat ; like the inſide of the eye, the ſkin of negroes, the ſpotted palate of ſeveral domeſtic animals, &c. And, laſtly, he ſays, that the colour of the hair generally correſponds with that of the iris. *Gazette litt. de Gottingue,* Oct. 1784.

“ At the very time that M. Blumenbach was reading this memoir to the Royal Society of Gottingen, M. Buzzi, ſurgeon to the hoſpital at Milan, an eleve of the celebrated Anatomiſt *Moſcati,* publiſhed in the *Opuſcoli Scelti de Milan,* 1784, t. vii. p. 11. a very intereſting memoir, in which he demonſtrates by diſſection what Blumenbach had only ſuppoſed.

“ A peaſant of about 30 years of age died at the hoſpital of Milan of a pulmonary diſorder. His body, being expoſed to view, was exceedingly remarkable by the uncommon whiteneſs of the ſkin, of the hair, of the beard, and of all the other covered parts of the body. M. Buzzi, who had long deſired an opportunity of diſſecting ſuch a ſubject, immediately ſeized upon this. He found the iris of the eyes perfectly white, and the pupil of a roſe-colour. The eyes were diſſected with the greateſt poſſible care, and were found entirely deſtitute of that black membrane which anatomiſts call the *uvea;* it was not to be ſeen either behind the iris, or under the retina: within the eye there was only found the choroid coat extremely thin and tinged, of a pale red colour, by veſſels filled with diſcoloured blood. What was more extraordinary, the ſkin, when detached from different parts of the body, ſeemed alſo entirely diveſted of the *rete mucoſum:* maceration did not diſcover the leaſt veſtige of this, nor even in the wrinkles of the abdomen, where it is moſt abundant and moſt viſible.

“ M. Buzzi likewiſe accounts for the whiteneſs of the ſkin and of the hair, from the abſence of the *rete mucoſum,* which, according to him, gives the colour to the cuticle, and to the hairs that are ſcattered over it. Among other proofs of this opinion, he alledges a well-known fact, that if the ſkin of the blackeſt horſe be accidentally deſtroyed in any part of the body, the hairs that afterwards grow on that part are always white, becauſe the *rete mucoſum* which tinges thoſe hairs is never regenerated with the ſkin.

“ The proximate cauſe of the whiteneſs of albinos, and the colour of their eyes, ſeems therefore pretty evidently to depend on the abſence of the *rete mucoſum:* But what is the remote cauſe?

“ In the firſt place, it ſeems probable that men affected with this infirmity form no diſtinct ſpecies, for they are produced from parents that have dark ſkins and black eyes. What is it then that deſtroys the *rete mucoſum* in ſuch perſons? M. Buzzi relates a ſingular fact, which ſeems to throw ſome light on this ſubject.

“A woman of Milan, named Calcagni, had ſeven ſons. The two eldeſt had brown hair and black eyes; the three next had white ſkins, white hair, and red eyes: the two laſt reſembled the two eldeſt. It was ſaid that this woman, during the three pregnancies that produced the albinos, had a continual and immoderate appetite for milk, which ſhe took in great quantities: but that when ſhe was with child of the other four children, ſhe had no ſuch deſire. It is not however aſcertained, that this preternatural appetite was not itſelf the effect of a certain heat, or internal diſeaſe, which deſtroyed the *rete mucoſum* in the children before they were born.

“ The albinos of Chamouni are alſo the offſpring of parents with dark ſkins and black eyes. They have three ſiſters by the ſame father and mother, who are alſo brunettes. One of them that I ſaw had the eyes of a dark brown, and the hair almoſt black. They are ſaid however to be all afflicted with a weakneſs of ſight. When the lads are married, it will be curious to obſerve how the eyes of their children will be formed. The experiment would be particularly deciſive if they were married to women like themſelves. But this faulty conformation ſeems to be more rare among women than among men; for the four of Milan, the two of Chamouni, the one deſcribed by Maupertuis, the one of Helvetius, and almoſt all the inſtances of theſe ſingular productions, have been of our ſex. It is known, however, that there are races of men and women affected with this diſeaſe, and that theſe races perpetuate themſelves, in Guinea, in Java, at Panama, &c.

“ Upon the whole, this degeneration does not ſeem to be owing to the air of the mountains; for though I have traverſed the greateſt part of the Alps, and the other mountains in Europe, theſe are the only individuals of the kind that ever I met with.”

ALBINOVANUS, a Latin poet, whom Ovid ſurnamed the *Divine.* There is now nothing of his extant, except an Elegy on Druſus, and another on the Death of Mecænas.

ALBINUS (Bernhard Siegfred), a celebrated phyſician and anatomiſt, was born of an illuſtrious family, at Francfort on the Oder in 1697. His father was then profeſſor of the practice of medicine in the univerſity of Francfort; but in the year 1702 he repaired to Leyden, being nominated profeſſor of anatomy and ſurgery in that univerſity. Here his ſon had an opportunity of ſtudying under the moſt eminent maſters in Europe, who, from the ſingular abilities which he then diſplayed, had no difficulty in prognoſticating his future eminence. But while he was diſtinguiſhed in every branch of literature, his attention was particularly turned to anatomy and ſurgery. His peculiar attachment to theſe branches of knowledge gained him the intimate friendſhip of Ruyſch and Rau, who at that time flouriſhed in Leyden; and the latter, ſo juſtly celebrated as a lithotomiſt, is ſaid to have ſeldom performed a capital operation without inviting him to be preſent. Having finiſhed his ſtudies at Leyden, he went to Paris, where he attended the lectures of Du-Verney, Vaillant, and other celebrated profeſſors. But he had ſcarce ſpent a year there, when he was invited by the curators of the univerſity of Leyden, to be a lecturer in anatomy and ſurgery in that place. Though contrary to his own inclination, he complied with their requeſt, and upon that occaſion was created Dr of phyſic without any examination. Soon after, upon the death of his father, he was appointed to ſucceed him as profeſſor of anatomy; and upon being admitted into that office on the 9th of November 1721, he delivered an oration, *De vera via ad fabricæ humani corporis cognitionem ducente;* which was heard with univerſal approbation. In the capacity of a profeſſor, he not only beſtowed the greateſt attention upon the inſtruction of the youth entruſted to his care, but in the improvement of the medical art. With this view, he publiſhed many important diſcoveries of his own; and by elegant editions, turned the attention of phyſicians to works of merit, which might otherwiſe have been neglected. By theſe means his fame was ſoon extended over Europe; and the ſocieties of London, Peterſburgh, and Harlem, cheerfully received him as an aſſociate. In 1745, he was appointed Profeſſor of the practice of medicine at Leyden, and was ſucceeded in the anatomical chair by his brother Frid. Bern. Albinus. He was twice rector of the univerſity, and as often he refuſed that high honour when it was voluntarily offered him. At length, worn out by long ſervice and intenſe ſtudy, he died on the 9th of September 1770, in the 74th year of his age.

ALBION, the ancient name of Britain.

New Albion, a name given by Sir Francis Drake to California.

ALBIREO, (in Aſtronomy) a ſtar of the third or fourth magnitude, in the conſtellation Cygnus.

ALBIS, (in anc. geog.) now the Elbe, which divided ancient Germany in the middle, and was the boundary of the ancient geography of Germany, ſo far as that country was known to the Romans: all beyond they owned to be uncertain, no Roman except Druſus and Tiberius having penetrated ſo far as the Elbe. In the year of the building of the city 744, or about ſix years before Chriſt, Domitius Ahenobarbus, croſſing the river with a few, merited the ornaments of a triumph; ſo glorious was it reckoned at Rome to have attempted the paſſage. In the following age, however, the river that before occupied the middle of ancient Germany, became its boundary to the north, from the irruptions of the Sarmatæ, who poſſeſſed themſelves of the Tranſalbin Germany. The Elbe riſes in the borders of Sileſia, out of the Riſenberg, runs through Bohemia, Miſnia, Upper Saxony, Anhalt, Magdeburg, Brandenburg, Danneburg, Lauenburg, Holſtein, and after being ſwelled by many other rivers, and paſſing by Hamburg and Glaukſtadt, falls into the German, or North ſea, to both which places the river is navigable by large veſſels.

ALBISOLA, a ſmall town belonging to the republic of Genoa: here is a porcelain manufacture, and ſeveral country houſes of the Genoeſe nobility. It was bombarded in 1745 by the Engliſh. E. Long. 8. 20. N. Lat. 44. 15.

ALBOGALERUS, in Roman antiquity, a white cap worn by the *flamen dialis*, on the top of which was an ornament of olive branches.

ALBORAK, among the Mahometan writers, the beaſt on which Mahomet rode in his journeys to heaven. The Arab commentators give many fables concerning this extraordinary vehicle. It is repreſented as of an intermediate ſhape and ſize between an aſs and a mule. A place, it ſeems, was ſecured for it in paradiſe at the interceſſion of Mahomet; which, however, was in ſome meaſure extorted from the prophet, by Alborak's refuſing to let him mount him when the angel Gabriel was come to conduct him to heaven.

ALBORO, in zoology, a name by which the erythrinus, a ſmall red fiſh, caught in the Mediterranean, is commonly known in the markets of Rome and Venice.

ALBOURG, a town of Denmark, in North Jutland, capital of the dioceſe of the ſame name, and a biſhop's ſee. It has this name, which ſignifies *eel-town*, on account of the great number of eels taken here. It is ſeated on a canal, 10 miles from the ſea, 30 north of Wiburgh, and 50 north of Arhuys. It has an exchange for merchants, and a ſafe and deep harbour. They have a conſiderable trade in herrings and corn; and a manufactory of guns, piſtols, ſaddles, and gloves. E. Long. 29. 16. N. Lat. 56. 35.

ALBRICIUS, born at London, was a great philoſopher, a learned and able phyſician, and well verſed in all the branches of polite literature. He lived in the 11th century, and wrote ſeveral books in Latin, particularly, 1. Of the origin of the gods. 2. The virtues of the ancients. 3. The nature of poiſon, &c.

ALBUCA, Baſtard ſtar-of-Bethlehem: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 10th order, *Coronariæ*. The characters are: The *calyx* is wanting: the *corolla* conſiſts of ſix oval oblong petals, which are perſiſtent: The *ſtamina* conſiſt of ſix three-ſided filaments the length of the corolla: Of theſe, three are fertile, with verſatile antheræ: three are barren, without antheræ: The *piſtillum* has an oblong three-ſided germen; the ſtylus is three-ſided; The *pericarpium* is an oblong obtuſe triangular capſule, having three cells and three valves: The *ſeeds* are numerous, flat, and incumbent. Of this genus Linnæus reckons only two.

Species. 1. The major, or ſtar-flower, with ſpear-ſhaped leaves. This is a native of Canada, and ſome other parts of North America: the root is bulbous: from whence ſhoot up eight or ten long, narrow, ſpear-ſhaped leaves. In the centre of theſe ariſes a flower-ſtem, a foot or more in height, garniſhed with a looſe ſpike of greeniſh yellow flowers. After the flowers are paſt, the germen ſwells to a three-cornered capſule, having three cells filled with flat ſeeds. 2. The minor, or African ſtar-flower, is a native of the Cape of Good Hope. This hath alſo a pretty large bulbous root, from which ariſe four or five narrow awl-ſhaped leaves, of a deep green colour; the flower-ſtem, which comes from the centre of the root, is naked and rarely riſes more than eight or nine inches high, having five or ſix greeniſh-yellow flowers, growing almoſt in the form of an umbel at top: theſe are rarely ſucceeded by ſeeds in Britain.

Culture. The Canada albuca is hardy; ſo the roots may be planted about four inches deep in a border of light earth, where they will thrive and produce their flowers late in the ſummer: but as the ſeeds do not often ripen in Britain, and the bulbs put out few offſets, the plants are not common in that country. The African ſort generally flowers twice a-year; firſt in March or April, and again in July or Auguſt; and if its roots are kept in pots filled with light earth, ſheltered under a hot-bed frame, they will flower even in winter; but the beſt method is to have a border in the front of a green-houſe, or ſtove, where the roots of moſt of the bulbous flowers may be planted in the full ground, and ſcreened in winter from froſt: in ſuch ſituations they thrive much better, and flower ſtronger, than when kept in pots.

ALBUGINEA tunica, in anatomy, the third or innermoſt coat or covering of the teſtis; it is likewiſe the name given to one of the coats of the eye.

ALBUGINEUS, in anatomy, a term ſometimes applied to the aqueous humour of the eye.

ALBUGO, or Leucoma, in medicine, a diſtemper occaſioned by a white opaque ſpot growing on the *cornea* of the eye, and obſtructing viſion. See MEDICINE (Index).

ALBUM, in antiquity, a kind of white table, or regiſter, wherein the names of certain magiſtrates, public tranſactions, &c. were entered. Of theſe there were various ſorts; as the *album decurionum, album ſenatorum, album judicum, album prætoris* &c.

ALBUM *Decurionum*, was the regiſter wherein the names of the *decuriones* were entered. This is otherwiſe called *matriculatio decurionum*.

ALBUM *Senatorum*, the liſt of ſenators names, which was firſt introduced by Auguſtus, and renewed yearly.

ALBUM *Judicum*, that wherein the names of the perſons of thoſe *decuriæ* who judged at certain times, were entered.

ALBUM *Prætoris* that wherein the *formulæ* of all actions, and the names of ſuch judges as the prætor had choſen to decide cauſes, were written.

The high-prieſt entered the chief tranſactions of each year into an *album*, or table, which was hung up in his houſe for the public uſe.

ALBUM is alſo uſed, in latter times, to denote a kind of table, or pocket-book, wherein the men of letters with whom a perſon has converſed, inſcribe their names with ſome ſentence or motto.—The famous Algernon Sydney being in Denmark, was by the univerſity of Copenhagen preſented with their *album*, whereupon he wrote theſe words:

———*Manus hæc inimica tyrannis*
Enſe petit placidam ſub libertate quietem.

ALBUM *Græcum*, among phyſicians, the white dung of dogs, formerly preſcribed for inflammations of the throat, &c. but now juſtly deſpiſed.

ALBUMAZAR, a learned Arabian aſtronomer in the tenth century, who wrote a treatiſe, *Of the Revolution of the Years.*

ALBUMEN, the white of an egg. For its nature, origin, and office, ſee EGG.

The white of an egg, according to Boerhaave, makes an extraordinary menſtruum. Being boiled hard in the ſhell, and afterwards ſuſpended in the air by a thread, it reſolves and drops down into an inſipid, ſcentleſs liquor, which appears to be that anomalous unaccountable menſtruum ſo much uſed by Paracelſus; and will, though it contain nothing ſharp, oleaginous, or ſaponaceous, make a thorough ſolution of myrrh; which is more than either water, oil, ſpirits or even fire itſelf, can effect.

A little putrid white of egg taken into the ſtomach, occaſions a nauſea, horror, fainting, vomiting, diarrhœa, and gripes; it inflames the bile, excites heat, thirſt, fever; and diſſolves the humours like the plague. On the contrary, the white of freſh-laid eggs, if taken while warm from the hen, is extremely nouriſhing to the infirm: it may be taken in luke-warm milk; but if any other heat is applied to it, the nutritious quality will be deſtroyed. The freſh white of an egg prevents burns from riſing in bliſters, if it is uſed immediately after the accident: it mitigates inflammations of the eyes, and preſerves the face from ſun-burning. In pharmacy, it is uſed as a medium to render balſams and turpentines, &c. miſcible with aqueous fluids; but as it diſagrees with many ſtomachs when thus taken, a mucilage of gum arabic may ſupply its place, it being as good a medium in ſimilar circumſtances, and not apt to offend the tendereſt ſtomach.—Whites of eggs are alſo uſeful for clarifying liquors; to which purpoſe, being mixed and incorporated with the liquors to be clarified, and the whole afterwards boiled, the whites of eggs are by this means brought together and hardened, and thus carry off the groſs parts of the liquor along with them.

ALBUQUERQUE, a ſmall city in Spain, in the province of Eſtremadura, is ſeated on an eminence, nine miles from the frontiers of Portugal. It is commanded by an almoſt impregnable fortreſs, built on a high mountain, and ſerving to defend the town. It carries on a great trade in wool and woollen manufactures. It was taken by the allies of Charles king of Spain, in 1705. W. Long. 7. 0. N. Lat. 38. 52.

ALBURN, the Engliſh name of a compound colour, being a mixture of white and red, or reddiſh brown. Skinner derives the word, in this ſenſe, from the Latin *albus*, and the Italian *burno*, from *bruno*, brown.

ALBURNUM, the ſoft white ſubſtance which in trees is found between the liber or inner bark and the wood, and in progreſs of time acquiring ſolidity, becomes itſelf the wood. From its colour and comparative ſoftneſs, it has been ſtyled by ſome writers the fat of trees, *adeps arborum*.

The alburnum is found in largeſt quantities in trees that are vigorous; though in ſuch as languiſh, or are ſickly, there is a great number of beds. In an oak ſix inches in diameter, this ſubſtance is nearly equal in bulk to the wood. In a trunk of one foot diameter, it is as one to three and a half; of two and a half feet diameter, as one to four and a half, &c. but theſe proportions vary according to the health and conſtitution of the trees.—The alburnum is frequently gnawed in pieces by inſects, which lodge in the ſubſtance, and are nouriſhed from it.

ALBURNUS, in zoology, a ſpecies of the *cyprinus* of Linnæus. See CYPRINUS.

ALCA, or AUK, in ornithology, a genus of the order of anſeres. The beak of this genus is without teeth, ſhort, convex, compreſſed, and frequently furrowed tranſverſely; the inferior mandible is gibbous near the baſe; the feet have generally three toes. The ſpecies of the alca are 12; of which the moſt remarkable are,

1. The impennis, northern penguin, or great auk, with a compreſſed bill furrowed on each ſide, and an oval ſpot on each ſide of the eyes. According to Mr Martin, this bird breeds on the iſle of St Kilda; appearing there the beginning of May, and retiring the middle of June. It lays one egg, which is ſix inches long, of a white colour; ſome are irregularly marked with purpliſh lines croſſing each other, others blotched with black, and ferruginous about the thicker end: If the egg is taken away, it will not lay another that ſeaſon. Mr Macaulay informs us that it does not viſit that iſland annually, but ſometimes keeps away for ſeveral years together; and adds, that it lays its egg cloſe to the ſea-mark, being incapable, by reaſon of the ſhortneſs of its wings, to mount higher. The length of this bird, to the end of its toes, is three feet: but its wings are ſo ſmall as to be uſeleſs for flight; the length, from the tip of the longeſt quill-feathers to

the firſt joint, being only four inches and a quarter. This bird is obſerved by ſeamen never to wander beyond ſoundings; and according to its appearance they direct their meaſures, being then aſſured that land is not very remote. It ſometimes frequents the coaſts of Norway, the Ferroe iſles, Iceland, Greenland, and Newfoundland; and feeds much on the lump-fiſh, father-laſher, and other fiſh of that ſize. The young birds eat roſe-root, and other plants. The old ones are very rarely ſeen on ſhore, tho' the young ones are not unfrequently met with. It is a very ſhy bird. It walks ill; but dives well and is taken in the manner uſed for the razor-bill and puffin. The ſkin between the jaws is blown into a bladder, and uſed for the darts of the Greenlanders, as is alſo that of ſome other birds. The ſkin of the body is ſuppoſed to be uſed by the Eſquimaux Indians for garments.

2. The alle, little auk, or black and white diver, with a ſmooth conical bill, a white ſtreak on the belly and wings, and black feet. The bulk of this ſpecies exceeds not that of a black-bird. It is not very common in Britain, being only met with now and then. It ſeems to be moſt plentiful towards the north, being met with in various parts as far as Spitzbergen. It is common in Greenland, in company with the black-billed ſpecies; feeds on the ſame food; and lays two blueiſh white eggs, larger than thoſe of a pigeon. It flies quick, and dives well; and is always dipping its bill into the water while ſwimming or at reſt on the water. In grows fat in the ſtormy ſeaſon, from the waves bringing plenty of crabs and ſmall fiſh within its reach; but from its ſize it is leſs ſought after than the others. In Greenland it is called the *Ice-bird*, being the harbinger of ice. This ſpecies is ſometimes ſeen of a pure white.

3. The arctica, or puffin, with a compreſſed bill and four furrows; the orbit of the eyes and temples are white. The legs of this ſpecies are very ſmall; and placed ſo far behind as to diſqualify it from ſtanding, except quite erect, reſting not only on the foot, but the whole length of the leg. This circumſtance* makes the riſe of the puffin from the ground very difficult, and it meets with many falls before it gets on wing; but when that is effected, few birds fly longer or ſtronger. Theſe birds frequent the coaſts of ſeveral parts of Great Britain and Ireland; but no place in greater numbers than Prieſtholm iſle, where their flocks may be compared to ſwarms of bees for multitude. Theſe are birds of paſſage; they reſort there annually about the fifth or tenth of April, quit the place (almoſt to a bird), and return twice or thrice before they ſettle to burrow and prepare for ovation and incubation. They begin to burrow the firſt week in May; but ſome few ſave themſelves that trouble, and diſlodge the rabbits from their holes, taking poſſeſſion of them till their departure from the iſle. Thoſe which form their own burrows, are at that time ſo intent on the work as to ſuffer themſelves to be taken by the hand. This taſk falls chiefly to the ſhare of the males; who alſo aſſiſt in incubation. The firſt young are hatched the beginning of July. The old ones ſhow vaſt affection towards them; and ſeem totally inſenſible of danger in the breeding ſeaſon. If a parent is taken at that time, and ſuſpended by the wings, it will in a ſort of deſpair treat itſelf moſt cruelly, by biting every part it can reach; and the moment it is looſed, will never offer to eſcape, but inſtantly reſort to its unfledged young; this affection ceaſes at the ſtated time of migration, which is moſt punctually about the 11th of Auguſt, when they leave ſuch young as cannot fly to the mercy of the peregrine falcon, who watches the mouths of the houſe for the appearance of the little deſerted puffins, which, forced by hunger, are compelled to leave their burrows. They lay only one egg. The eggs differ much in form; ſome have one end very acute; others have both extremely obtuſe; all are white. Their fleſh is exceſſively rank, as they feed on ſea-weeds and fiſh, eſpecially ſprats: but when pickled and preſerved with ſpices, are admired by thoſe who love high-eating. Dr Caius tells, that, in his days, the church allowed them in lent, inſtead of fiſh: he alſo acquaints us, that they were taken by means of ferrets, as we take rabbits: at preſent, they are either dug out, or drawn from their burrows by a hooked ſtick: they bite extremely hard; and keep ſuch faſt hold on whatever they faſten, as not to be eaſily diſengaged. Their noiſe, when taken, is very diſagreeable; being like the efforts of a dumb perſon to ſpeak. Theſe birds are alſo common in Ireland; on the iſland Sherries, three leagues N. N. W. of Holyhead; and in the S. Stack, near Holyhead, they breed in plenty. They inhabit Iceland and Greenland; and breed in the extreme part of the iſlands. It is alſo found in the Ferroe iſles, where it is called *Lunda*; and in the Farn iſles, where it is called *Coulterneb*, from the ſhape of the bill. It goes alſo by various other names; ſuch as *Gulden-head*, *Bottle-noſe*, and *Helegug*, in Wales; at Scarborough, *Mullet*; and in Cornwall, *Pope*. In America they are ſaid to frequent Carolina in winter; and have been met with in Sandwich Sound by late voyagers; the natives ornament the fore parts and collar of their ſeal-ſkin jackets with the beaks of them; and thoſe of Aoonalaſhka wear gowns of their ſkins, along with thoſe of other birds. On the coaſt of Kamtſchatka and the Kurulſchi iſlands they are common, even on the Penſchinſki bay, almoſt as far as Ochotka: the nations of the two firſt wear the bills about their necks faſtened to ſtraps; and, according to the ſuperſtition of theſe people, their ſhaman or prieſt muſt put them on with a proper ceremony, in order to procure good fortune.

4. The torda, or razor-bill, with four furrows on the bill, and a white line on each ſide running from the bill to the eyes. Theſe birds, in company with the guillemot, appear in the Engliſh ſeas the beginning of February; but do not ſettle on their breeding places till they begin to lay, about the beginning of May. They inhabit the ledges of the higheſt rocks that impend over the ſea, where they form a groteſque appearance; ſitting cloſe together, and in rows one above another. They properly lay but one egg a-piece, of an extraordinary ſize for the bulk of the bird, being three inches long: it is either white, or of a pale ſea-green, irregularly ſpotted with black: if this egg is deſtroyed, both the auk and the guillemot will lay another; if that is taken, then a third: they make no neſt, depoſiting their egg on the bare rock; and though ſuch multitudes lay contiguous, by a wonderful inſtinct each diſtinguiſhes its own. What is alſo matter of great amazement, they fix their egg on the ſmooth rock, with ſo exact a balance, as to ſecure it from rolling off; yet ſhould

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* It attends every one of the genus.

Alca.

ſhould it be removed, and then attempted to be replaced by the common hand, it is extremely difficult, if not impoſſible, to find its former equilibrium. According to Mr Latham, it is by means of a cement that the bird fixes its egg. The eggs are food to the inhabitants ot the coaſts they frequent; which they get with great hazard; being lowered from the top by ropes, truſting to the ſtrength of their companions, whoſe footing is often ſo unſtable that they are forced down the precipice, and periſh together. Theſe birds are found in the north of Europe, alſo in Iceland, Greenland, and on the coaſt of Labrador. In Europe they extend along the White Sea into the Arctic Aſiatic ſhores, and from thence to Kamtſchatka and the gulph of Oſchotka: It is the only one that reaches the inland Baltic; being found there on the Carls-Ozar iſles, near Gothland, and the iſland of Bondon off Angermania.

5. The pica, or black-billed auk, has the bill of the ſame form with the torda, but is entirely black. The cheeks, chin, and throat, are white: in all other reſpects it agrees with the former ſpecies. Mr Latham is of opinion that it is no other than the young of that ſpecies. Mr Pennant obſerves, that it is ſometimes found on our coaſts; but, according to Mr Latham, it is in the winter ſeaſon only, when the common ſort has quitted them. They are ſaid to be met with on the coaſt of Candia and other parts of the Mediterranean; "Where, no doubt (Mr Latham obſerves) the complete old bird is likewiſe found, as I have been informed that they are common in the bay of Gibraltar, where it is curious to ſee their activity under water when purſuing the fiſh; for, as the water in the bay is ſometimes clear for a great depth from the ſurface, theſe birds may be often ſeen as it were flying after their prey, with all the agility of a bird in the air, turning in every direction after the fiſh, with ſuch wonderful addreſs and dexterity as ſeldom to miſs their aim."

6. The cirhata of Dr Pallas, or tufted auk, ſomewhat bigger than the common puffin, and the colours much the ſame: the bill is an inch and three-quarters in length, the ſame in depth at the baſe, and croſſed with three furrows: over each eye ariſes a tuft of feathers four inches in length, which falls elegantly on each ſide of the neck, reaching almoſt to the back; and are white as far as they are attached to the head, but afterwards of a fine buff yellow: the legs are of a bright red, the claws black. The female is principally diſtinguiſhed by having the bill croſſed only with two furrows inſtead of three. This ſpecies inhabits the ſhores of Kamtſchatka, the Kurile iſlands, and thoſe intervening between Kamtſchatka and America. In manners it greatly reſembles the puffin; living all day at ſea, but at no great diſtance from the rocks; it comes on ſhore at night; burrows a yard deep under ground, and makes a neſt, with feathers and ſea plants; is monogamous, and lodges there the whole night with its mate. It lays one white egg, the end of May or beginning of June, which alone is thought fit to be eaten, the fleſh of the bird itſelf being inſipid and hard. It feeds on crabs, ſhrimps, and ſhell-fiſh, which laſt it forces from the rocks with its ſtrong bill. Pallas remarks, that the Kamtſchatkan girls imitate the tufts of theſe birds, which nature has ſupplied them with, by placing a ſimilar ſtrip of the white ſkin of the glutton behind each ear, hanging down behind by way of ornament; and is a well-received preſent from a lover to his miſtreſs. The bills of both this and the common puffin were formerly held by the natives as a charm, and worn by the prieſts as amulets; indeed at the preſent theſe have been ſeen fixed round their head-dreſſes, but ſuppoſed now to be only eſteemed as mere ornaments: the ſkins are however made uſe of for clothing, being ſewed together. It is called in Kamtſchatka, *Muechagatka;* and in Oſchotka, *Igilma.*

Alca, Alcæus.

7. The pſittacula, or perroquet auk, of Dr Pallas, is about the ſize of the little auk. The bill is much compreſſed on the ſides, in ſhape convex both above and below, and of a bright red colour: from the remote corner of each eye is a very ſlender tuft of fine white feathers, hanging down the neck: the head and upper part of the body are duſky; the lower whitiſh, varied with black edges: the legs are of a dirty yellow; and the webs duſky. This ſpecies is found at Kamtſchatka, in the iſles towards Japan, and on the weſtern ſhores of America. They are ſometimes ſeen in flocks, but ſeldom far from land, except driven by ſtorms. Of nights they harbour in the crevices of rocks. They lay an egg almoſt the ſize of a hen's, of a dirty white or yellowiſh colour ſpotted with brown; which they do about the middle of June, upon the bare rock or ſand, for they make no neſt. Like moſt of the tribe, they are ſtupid birds, as may be evinced by the ridiculous method of catching them:—One of the natives places himſelf under a looſe garment of fur, of a particular make, with large open ſleeves, among the rocks, at evening; when the birds, returning to their lodging-places at duſk, run under the ſkirts, and up the arm-holes, for ſhelter during the night; and thus become an eaſy prey. Their ſtupidity likewiſe occaſions them to fly aboard a ſhip at ſuch times, miſtaking it for a rooſting place; whereby navigators have been taught to avoid the danger of falling in too near with land, either of evenings, or on approaching ſtorms. The eggs are eſteemed good.

ALCÆUS, a famous ancient lyric poet, born at Mitylene, in the iſland of Leſbos. Horace ſeems to think him the inventor of this kind of poeſy:

> Now the Roman muſe inſpire,
> And warm the ſong with Grecian fire. *Francis.*

He flouriſhed in the 44th Olympiad, at the ſame time with Sappho, who was likewiſe of Mitylene. Alcæus was a great enemy to tyrants, but not a very brave ſoldier. He was preſent at an engagement, wherein the Athenians gained a victory over the Leſbians; and here, as he himſelf is ſaid to have confeſſed in one of his pieces, he threw down his arms, and ſaved himſelf by flight. Horace, who, of all the Latin poets, moſt reſembled Alcæus, has made the like confeſſion:

> With thee I ſaw Philippi's plain,
> Its fatal rout, a fearful ſcene!
> And dropp'd, alas! th' inglorious ſhield,
> Where valour's ſelf was forc'd to yield;
> Where foil'd in duſt the vanquiſh'd lay,
> And breath'd th' indignant ſoul away. *Francis.*

The poetical abilities of Alcæus are indiſputed; and though his writings were chiefly in the lyric ſtrain, yet his muſe was capable of treating the ſublimeſt ſubjects with a ſuitable dignity. Hence Horace ſays,

> Alcæus ſtrikes the golden ſtrings,
> And ſeas, and war, and exile, ſings.
> Thus while they ſtrike the various lyre,
> The ghoſts the ſacred ſounds admire:
> But when Alcæus lifts the ſtrain
> To deeds of war and tyrants ſlain,
> In thicker crowds the ſhadowy throng
> Drink deeper down the martial ſong. *Francis.*

Alcæus, an Athenian tragic poet, and, as ſome think, the firſt compoſer of tragedies. He renounced his native country Mitylene, and paſſed for an Athenian. He left ten pieces, one of which was Paſiphaë, that which he produced when he diſputed with Ariſtophanes, in the fourth year of the 97th Olympiad.

There is another Alcæus mentioned in Plutarch, perhaps the ſame whom Porphyrius mentions as a compoſer of ſatirical iambics and epigrams, and who wrote a poem concerning the plagiariſm of Euphorus the hiſtorian. He lived in the 145th Olympiad.

We are told likewiſe of one Alcæus, a Meſſenian, who lived in the reign of Veſpaſian and Titus. We know not which of theſe it was who ſuffered for his lewdneſs a very ſingular kind of death, which gave occaſion to the following epitaph:

’Αλκαιȣ ταφος ȣτος, &c.

> This is Alcæus's tomb; who died by a radiſh,
> The daughter of the earth, and puniſher of Adulterers.

This puniſhment inflicted on adulterers, was thruſting one of the largeſt radiſhes up the anus of the adulterer; or, for want of radiſhes, they made uſe of a fiſh with a very large head, which Juvenal alludes to:

> *Quoſdam mœchos et mugilis intrat.* *Sat.* x.
> The mullet enters ſome behind.

Hence we may underſtand the menace of Catullus,

> *Ah! tum te miſerum, malique fati,*
> *Quem attractis pedibus, patente porta,*
> *Percurrent raphanique magileſque.* *Epig.* xv.
> Ah! wretched thou, and born to luckleſs fate,
> Who art diſcover'd by the unſhut gate!
> If once, alas! the jealous huſband come,
> The radiſh or the ſea-fiſh is thy doom.

ALCAICS, in ancient poetry, a denomination given to ſeveral kinds of verſe, from Alcæus, their inventor.

The firſt kind conſiſts of five feet, viz. a ſpondee, or iambic; an iambic; a long ſyllable; a dactyle; another dactyle: ſuch is the following verſe of Horace,

> *Omnes* | *eo*|*dem cogimur,* | *omnium*
> *Verſa*|*tur ur*|*nâ* | *ſerius* | *ocyus* |
> *Sors exitura.*

The ſecond kind conſiſts of two dactyles and two trochees: as,

> *Exili*|*um impoſi*|*tura* | *cymbæ.*

Beſides theſe two, which are called *dactylic Alcaïcs*, there is another ſtyled ſimply *Alcaïc;* conſiſting of an epitrite; a choriambus; another choriambus; and a bacchius: the following is of this ſpecies,

> *Cur timet fla*|*vum Tiberim tan*|*gere, cur* | *olivum?*

Alcaic Ode, a kind of manly ode compoſed of ſeveral ſtrophes, each conſiſting of four verſes; the two firſt of which are always Alcaïcs of the firſt kind; the third verſe is a diameter hypercatalectic, or conſiſting of four feet and a long ſyllable; and the fourth verſe is an Alcaïc of the ſecond kind. The following ſtrophe is of this ſpecies, which Horace calls *minaces Alcæi camenæ.*

> *Non poſſidentem multa vocaveris*
> *Recte beatum: rectius occupat*
> *Nomen beati, qui deorum*
> *Muneribus ſapienter uti, &c.*

ALCAID, Alcayde, or Alcalde, in the polity of the Moors, Spaniards, and Portugueſe, a magiſtrate, or officer of juſtice, anſwering nearly to the French provoſt, and the Britiſh juſtice-of-peace.—The alcaid among the Moors is veſted with ſupreme juriſdiction, both in civil and criminal caſes.

ALCALA de Guadeira, a ſmall town of Spain, in Andaluſia, upon the river Guadeira. Here are abundance of ſprings, from whence they convey water to Seville by an aqueduct. W. long. 6. 16. N. lat. 37. 15.

Alcala de Henares, a beautiful and large city of Spain, in New Caſtile, ſeated upon the river Henares, which waſhes its walls. It is built in a very agreeable plain, and is of an oval figure. The ſtreets are handſome and pretty ſtraight; one of them is very long, running from one end of the city to the other. The houſes are well built; and there are ſeveral ſquares, the largeſt of which is an ornament to the city; it is ſurrounded on all ſides with piazzas, where tradeſmen have their ſhops, to expoſe ſeveral ſorts of commodities to ſale, of which there is as great plenty and variety as in moſt towns of Spain. The univerſity was founded by cardinal Ximenes, archbiſhop of Toledo, about the beginning of the 16th century. The land about Alcalo is watered by the Henares, well cultivated, and very fruitful, while that at a diſtance is dry and ſterile: it yields grain in plenty, very good muſcat wine, and melons of a delicious kind. Without the walls is a ſpring, the water of which is ſo pure and ſo well taſted, that it is incloſed and ſhut up for the king of Spain's own uſe, from whence it is carried to Madrid.—This city is 10 miles ſouth-weſt of Guadalaxara, and 13 miles eaſt of Madrid. W. long. 4. 20. N. lat. 40. 30.

Alcala-Real, a ſmall city of Spain, in Andaluſia, with a fine abbey. It is built on the top of a high mountain, in a mountainous country; and the road to it is incommodious, rough, and unequal; but to make amends for this here are ſeveral kinds of exquiſite fruit and wine. W. Long. 4. 15. N. Lat. 37. 18.

ALCALY, or Alcali, or Alkali. See Chemistry, *Index.*

ALCANIS, a town of Arragon in Spain, ſeated on the river Gaudaloup, twelve miles from Caſpe. It was formerly the capital of the kingdom of the Moors; but being taken from them, it was made a commandery of the order of Calatrava. Here is a very remarkable fountain, which throws up water through 42 pipes. It is ſurrounded with gardens and fruit-trees, and defended with a good fortreſs. W. Long. 0. 5. N. Lat. 41. 0.

ALCANNA, in commerce, a powder prepared from the

Alcantara ‖ Alcaſſar.

the leaves of the Egyptian privet, in which the people of Cairo drive a conſiderable trade. It is much uſed by the Turkiſh women to give a golden colour to their nails and hair. In dyeing, it gives a yellow colour when ſteeped with common water, and a red one when infuſed in vinegar. There is alſo an oil extracted from the berries of alcanna, and uſed in medicine as a calmer.

ALCANTARA, a ſmall, but very ſtrong city of Eſtremadura, in Spain. It gives name to one of the three orders of knighthood. It is ſeated on the banks of the Tajo, or Tagus, 21 miles from Coria, in a very fruitful ſoil, and is celebrated for its bridge over that river. This was built in the time of the emperor Trajan, as appears by an inſcription over one of the arches, by the people of Luſitania, who were aſſeſſed to ſupply the expence. It is raiſed 200 feet above the level of the water; and though it conſiſts but of ſix arches, is 670 feet in length, and 28 in breadth. At the entrance of the bridge, there is a ſmall antique chapel hewn in a rock by the ancient Pagans, who dedicated it to Trajan, as the Chriſtians did to St Julian. This city was built by the Moors, on account of the convenience of this bridge; which is at a place where the Tajo is very deep, running between two high ſteep rocks: for this reaſon, they called it *Al-Cantara*, which, in their language, ſignifies *the Bridge*. It was taken from them in 1214, and given to the knights of *Calatrava*, who afterwards aſſumed the name of *Alcantara*. It was taken by the Earl of Galloway, in April, 1706, and retaken by the French in November following. It is 45 miles from Madrid, and 125 from Seville. W. Long. 7. 12. N. Lat. 39. 30.

Knights of ALCANTARA, a military order of Spain, which took its name from the above-mentioned city. They make a very conſiderable figure in the hiſtory of the expeditions againſt the Moors. The knights of Alcantara make the ſame vows as thoſe of Calatrava, and are only diſtinguiſhed from them by this, that the croſs fleur de lys, which they bear over a large white cloak, is of a green colour. They poſſeſs 37 commanderies. By the terms of the ſurrender of Alcantara to this order, it was ſtipulated, that there ſhould be a confraternity between the two orders, with the ſame practices and obſervances in both; and that the order of Alcantara ſhould be ſubject to be viſited by the grand-maſter of Calatrava. But the former ſoon releaſed themſelves from this engagement, on pretence that their grand-maſter had not been called to the election of that of Calatrava, as had been likewiſe ſtipulated in the articles. After the expulſion of the Moors, and the taking of Granada, the ſovereignty of the order of Alcantara and that of Calatrava was ſettled in the crown of Caſtile by Ferdinand and Iſabella.—In 1540, the knights of Alcantara ſued for leave to marry, which was granted them.

ALCAREZ, a ſmall city of La Mancha, in Spain, defended by a pretty ſtrong caſtle, and remarkable for an ancient aqueduct. It ſtands near the river Guardamana, and the ſoil about it is very fruitful. They have a breed of little running-horſes, which are very fleet and ſtrong. It is 25 miles north of the confines of Andaluſia, 108 ſouth of Cuenza, and 130 ſouth-by-eaſt of Madrid. W. Long. 1. 50. N. Lat. 38. 28.

ALCASSAR DO SAL, a town of Portugal, in Eſtremadura, which has a caſtle ſaid to be impregnable. It is indeed very ſtrong, both by art and nature, being built on the top of a rock which is exceedingly ſteep on all ſides. Here is a ſalt-work which produces very fine white ſalt, from whence the town takes its name. The fields produce large quantities of a ſort of ruſhes, of which they make mats, which are tranſported out of the kingdom. W. Long. 9. 10. N. Lat. 38. 18.

Alcaſſar, Alcavala.

ALCASSAR, a city of Barbary, ſeated about two leagues from Larache, in Aſga, a province of the kingdom of Fez. It was of great note, and the ſeat of the governor of this part of the kingdom. It was built by Jacob Almanzor, king of Fez, about the year 1180, and deſigned for a magazine and place of rendezvous for the great preparations he was making to enter Granada in Spain, and to make good the footing Joſeph Almanzor had got ſome time before. It is ſaid his father firſt invaded Spain with 300,000 men, moſt of whom he was obliged to bring back to Africa to quiet a rebellion that had broke out in Morocco. This done, he returned to Spain again with an army, as is ſaid, of 200,000 horſe and 300,000 foot. The city is now fallen greatly to decay, ſo that of fifteen moſques there are only two that they make uſe of. The reaſon, probably, is the bad ſituation of the town; for it ſtands ſo low, that it is exceſſively hot in ſummer, and almoſt overflowed with water in the winter. This they affirm to be owing to a curſe of one of their ſaints. Here are a great number of ſtorks, who live very familiarly with the people, walking about the town, poſſeſſing the tops of the houſes and moſques without moleſtation; for they eſteem them ſacred birds, and account it ſinful to diſturb them. At preſent, the baſhaw of Tetuan appoints a governor to this town, which is the laſt of his dominions towards Mequinez. Near this city there is a high ridge of mountains, running towards Tetuan, whoſe inhabitants were never brought entirely under ſubjection; and whenever it was attempted, they revenged themſelves by infeſting the roads, and robbing and deſtroying the travellers. When they were purſued, they retired into their woody mountains, where none could ſafely follow them. Not far from hence is the river Elmahaſſen, famous for the battle fought between Don Sebaſtian king of Portugal and the Moors; in which the Portugueſe were defeated and their king ſlain. W. Long. 12. 35. N. Lat. 35. 15.

ALCAVALA, in the Spaniſh finances, was at firſt a tax of ten per cent. afterwards of fourteen per cent. and is at preſent of only ſix per cent. upon the ſale of every ſort of property, whether moveable or immoveable; and it is repeated every time the property is ſold. The levying of this tax requires a multitude of revenue-officers ſufficient to guard the tranſportation of goods, not only from one province to another, but from one ſhop to another. It ſubjects not only the dealers in ſome ſorts of goods, but thoſe in all ſorts, every farmer, every manufacturer, every merchant and ſhopkeeper, to the continual viſits and examination of the tax-gatherers. Through the greater part of a country in which a tax of this kind is eſtabliſhed, nothing can be produced for diſtant ſale. The produce of every part of the country muſt be proportioned to the conſumption of the neighbourhood. It is to the Alcavala, accordingly, that Uſtaritz imputes the ruin of the manufactures of Spain. He might have imputed to it likewiſe the declenſion of agriculture, it being impoſed not only upon manufactures, but upon the rude produce of the land.

ALCAZAR LEGUER, a town of Africa, in the kingdom of Fez, and in the province of Ilabat. It was taken by Alphonſo, king of Portugal, in 1468; but ſoon after that, it was abandoned to the Moors. It is ſeated on the coaſt of the ſtraits of Gibraltar. W. Long. 5. 30. N. Lat. 38. 0.

ALCAZER, a town of Spain, in New Caſtile, ſeated on the river Guardamana, which has a fortreſs on a high hill for its defence, and lies in a very fruitful country. It is 100 miles north-weſt of Carthagena. W. Long. 2. 10. N. Lat. 38. 15.

ALCE, ALCES, or ELK, in zoology, the trivial name of a ſpecies of the cervus, belonging to the order of mammalia pecora. See CERVUS.

ALCEA, the HOLLY-HOCK: A genus of the polyandria order, belonging to the monodelphia claſs of plants; and in the natural method ranking under the 37th order, *Columniferæ*. The characters are: The *calyx* is a double perianthium, monophyllous and perſiſtent; the exterior one ſix-cleft, the interior half five-cleft: The *corolla* conſiſts of five petals, coaleſced at the baſe, heart-ſhaped inverſely, and expanding: The *ſtamina* conſiſt of numerous filaments, coaleſced below into a five-cornered cylinder, looſe above, and inſerted into the corolla; the antheræ are kidney-ſhaped: The *piſtillum* has a roundiſh germen; a ſhort cylindric ſtylus; and numerous briſtly ſtigmata the length of the ſtylus: The *pericarpium* conſiſts of many arilli, jointed into a verticillum about a columnar depreſſed receptacle: The *ſeeds* are ſolitary, reniform, and depreſſed.

Species. Although Linnæus mentions two diſtinct ſpecies of this genus, viz. the *roſea* and *ficifolia*, he thinks, that the latter may perhaps be only a variety of the former; but Mr Miller affirms them to be diſtinct ſpecies, whoſe difference in the form of their leaves always continues. The leaves of the firſt ſort are roundiſh, and cut at their extremities into angles; thoſe of the ſecond are deeply cut into ſix or ſeven ſegments, ſo as to reſemble a hand. Cultivation produces almoſt an infinite variety of this plant, ſuch as double-flowered, ſingle-flowered, deep red, pale red, blackiſh red, white, purple, yellow, and fleſh-colour. The firſt ſpecies is a native of China, the ſecond grows alſo in Iſtria. Tho' natives of warm countries, they are hardy enough to thrive in the open air in Britain, and have for many years been ſome of the greateſt ornaments in gardens, towards the end of ſummer; but they have the inconvenience of growing too large for ſmall gardens, and requiring tall ſtakes to ſecure them from being broken by ſtrong winds. In large gardens, however, when properly diſpoſed, they make a fine appearance; for as their ſpikes of flowers grow very tall, there will be a ſucceſſion of them on the ſame ſtems more than two months: the flowers on the lower part of the ſpike appear in July; and as their ſtalks advance, new flowers are produced till near the end of September. When planted in good ground, the ſtalks will often riſe to the height of eight or nine feet; ſo that near ſix feet of each will be garniſhed with flowers, which, when double and of good colours, make a very beautiful appearance.

Culture. The holly-hock is propagated by ſeeds, which ſhould be carefully ſaved from thoſe plants whoſe flowers are double and of the beſt colours: for though the duplicity of the flowers, as well as their colour, are only accidental properties, yet the young plants will produce nearly the ſame kind of flowers with thoſe from which the ſeeds are taken, provided no plants with ſingle or bad-coloured flowers are permitted to grow near them; and as ſoon as ſuch appear they ought to be removed from the good ones, that their farina may not ſpread into the others, which would cauſe them to degenerate. The ſeeds ought to be gathered very dry, and remain in their capſules until ſpring; but care muſt be taken that no wet comes to them in winter, otherwiſe the covers would turn mouldy, and ſpoil their contents.—They ſhould be ſown in drills, about the middle of April, on a bed of light earth, and covered with earth of the ſame kind about half an inch deep. When the plants have put out ſix or eight leaves, they ſhould be tranſplanted into nurſery-beds, obſerving to water them until they have taken good root; after which they will require no farther care, but to keep them clean from weeds till October, when they ſhould be tranſplanted where they are to remain.

ALCEDO, or KINGS-FISHER, in ornithology, a genus of the order of picæ. The alcedo has a long, ſtrait, thick, triangular bill; with a fleſhy, plain, ſhort, flat tongue.

Of this genus there are a great many ſpecies, with one or other of which almoſt every part of the world is furniſhed. Moſt of them frequent rivers, and live on fiſh, the ſingularity of catching which is admirable: ſometimes hovering over the water, where a ſhoal of ſmall fiſhes is ſeen playing near the ſurface; at other times waiting with attention, on ſome low branch hanging over the water, for the approach of a ſingle one who is ſo unlucky as to ſwim that way; in either caſe dropping like a ſtone, or rather darting with rapidity on his prey; when, ſeizing it croſſwiſe in his bill, it retires to a reſting place to feaſt on it; which it does piece-meal, bones and all, without reſerve, afterwards bringing up the indigeſtible parts in pellets, like birds of prey. The wings of moſt of the genus are very ſhort; yet the birds fly rapidly, and with great ſtrength. It may be remarked, that throughout this genus, blue, in different ſhades, is the moſt predominant colour.—The ſpecies found in the South Sea Iſlands are held in a kind of ſuperſtitious veneration by the natives of the places they ſeverally inhabit, perhaps on account of their being frequently ſeen flying about the morais or burial-places. That which inhabits Otaheite, where it is called *Erooro*, is accounted particularly ſacred, and not allowed to be taken or killed.

1. The iſpida, or common kings-fiſher, is not much larger than a ſwallow; its ſhape is clumſy; the bill diſproportionably long; it is two inches from the baſe to the tip; the upper chap black, and the lower yellow. But the colours of the bird atone for its inelegant form; the crown of the head and the coverts of the wings are of a deep blackiſh green, ſpotted with bright azure: the back and tail are of the moſt reſplendent azure; the whole under-ſide of the body is orange-coloured; a broad mark of the ſame paſſes from the bill beyond the eyes; beyond that is a large white ſpot: the tail is ſhort, and conſiſts of twelve feathers of a rich deep blue;

blue ; the feet are of a reddiſh yellow, and the three joints of the outmoſt toe adhere to the middle toe, while the inner toe adheres only by one.

From the diminutive ſize, the ſlender ſhort legs, and the beautiful colours of this bird, no perſon would be led to ſuppoſe it one of the moſt rapacious little animals that ſkims the deep. Yet it is forever on the wing, and feeds on fiſh ; which it takes in ſurpriſing quantities, when we conſider its ſize and figure. It takes its prey after the manner of the oſprey, balancing itſelf at a certain diſtance above the water for a conſiderable ſpace, then darting into the deep, and ſeizing the fiſh with inevitable certainty. While it remains ſuſpended in the air in a bright day, the plumage exhibits a beautiful variety of the moſt dazzling and brilliant colours. This ſtriking attitude did not eſcape the notice of the ancients ; for Ibycus, as quoted by Athenæus, ſtyles theſe birds αλκυονες τανυσιπτεροι, the halcyons with expanded wings. It makes its neſt in holes in the ſides of the cliffs, which it ſcoops to the depth of three feet ; and lays from five to nine eggs, of a moſt beautiful ſemi-tranſparent white. The female begins to lay early in the ſeaſon, and excludes her firſt brood about the beginning of April. The male, whoſe fidelity exceeds even that of the turtle, brings her large proviſions of fiſh while ſhe is thus employed ; and ſhe, contrary to moſt other birds, is found plump and fat at that ſeaſon. The male, that uſed to twitter before this, now enters the neſt as quietly and as privately as poſſible. The young ones are hatched at the expiration of 20 days ; but are ſeen to differ as well in their ſize as in their beauty.

This ſpecies is the αλκυωναφωνος, or mute halcyon of Ariſtotle, which he deſcribes with more preciſion than is uſual with that great philoſopher. After his deſcription of the bird follows that of its neſt ; than which the moſt inventive of the ancients have delivered nothing that appears at firſt ſight more fabulous and extravagant. He relates, that it reſembled thoſe concretions that are formed by the ſea-water ; that it reſembled the long-necked gourd ; that it was hollow within ; that the entrance was very narrow, ſo that, ſhould it overſet, the water could not enter ; that it reſiſted any violence from iron, but could be broke with a blow from the hand ; and that it was compoſed of the bones of the Βελονη, or ſea-needle. The neſt had medical virtues aſcribed to it, and from the bird was called *Halcyoneum*. In a fabulous age, every odd ſubſtance that was flung aſhore received that name ; a ſpecies of tubular coral, a ſponge, a zoophite, and a miſcellaneous concrete, having by the ancients been dignified with that title from their imaginary origin.* Yet much of this ſeems to be founded on truth. The form of the neſt is juſtly deſcribed ; and the materials which Ariſtotle ſays it was compoſed of, are not entirely of his own invention. Whoever has ſeen the neſt of the kings-fiſher, will obſerve it ſtrewed with the bones and ſcales of fiſh : the fragments of the food of the owner and its young.—On the foundation laid by the philoſopher, ſucceeding writers formed other tales extremely abſurd ; and the poets, indulging the powers of imagination, dreſſed the ſtory in all the robes of romance. This neſt was a floating one :

> Incubat *halcyone* pendentibus æquore nidis.
> Ovid. Met. lib. xi.

It was therefore neceſſary to place it in a tranquil ſea, and to ſupply the bird with charms to allay the fury of a turbulent element during the time of its incubation ; for it had, at that ſeaſon, power over the ſeas and the winds.

> Χ' αλκυονες ϛορησευντι τα κυματα, ταν τε θαλασσαν,
> Τον τε νοτον, τον τ' ευρον, ος εσχατα φυκια κινει
> Α'λκυονης, γλαυκᾶις Νηρηισι ται τε μαλιϛα
> Ορνιθων εφιλαθεν. THEOCRIT. Idyl. vii. l. 57.

> May *Halcyons* ſmooth the waves and calm the ſeas,
> And the rough ſouth-eaſt ſink into a breeze ;
> *Halcyons*, of all the birds that haunt the main,
> Moſt lov'd and honour'd by the *Nereid* train.
> FAWKES.

Theſe birds were equally favourites with Thetis as with the Nereids ;

> Dilectæ *Thetidi* Halcyones. VIRG. Georg. I. 399.

as if to their influence theſe deities owed a repoſe in the midſt of the ſtorms of winter, and by their means were ſecured from thoſe winds that diſturbed their ſubmarine retreats, and agitated even the plants at the bottom of the ocean.

Such are the accounts given by the Roman and Sicilian poets. Ariſtotle and Pliny tell us, that this bird is moſt common in the ſeas of Sicily ; that it ſat only a few days, and thoſe in the depth of winter ; and during that period the mariner might ſail in full ſecurity ; for which reaſon they were ſtyled *Halcyon days*.

> Perque dies placidos hiberno tempore ſeptem
> Incubat *Halcyone* pendentibus æquore nidis :
> Tum via tuta maris : ventos cuſtodit, et arcet
> Æolus egreſſu. OVID. Met. l. xi.

> *Alcyone*, compreſs'd,
> Seven days ſits brooding on her watery neſt,
> A wintry queen ; her ſire at length is kind,
> Calms every ſtorm, and huſhes every wind.

In after-times, theſe words expreſſed any ſeaſon of proſperity : theſe were the *Halcyon days* of the poets ; the brief tranquillity, the *ſeptem placidi dies*, of human life.

The poets alſo made it a bird of ſong. Virgil ſeems to place it in the ſame rank with the linnet ;

> Littoraque *Halcyonem* reſonant, et *Acanthida* dumi.
> GEORG. III. 338.

And Silius Italicus celebrates its muſic, and its floating neſt :

> Cum ſonat *Halcyone* cantu, nidoſque natantes
> Immota geſtat ſopitis fluctibus unda. *Lib.* xiv. 275.

But theſe writers ſeem to have transferred to our ſpecies, the harmony that belongs to the *vocal alcedo*,* one of the loſt birds of the ancients.

As the ancients have had their fables concerning this bird, ſo have the modern vulgar. It is an opinion generally received among them, that the fleſh of the kings-fiſher will not corrupt, and that it will even baniſh all vermin. This has no better foundation than that which is ſaid of its always pointing, when hung up dead, with its breaſt to the north. The only truth which can be affirmed of this bird when dead is, that its fleſh is utterly unfit to be eaten; while its beautiful plumage preſerves its luſtre longer than that of any other bird we know.

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* Plin. lib. xxxii. c. 8. Dioſc. lib. v. c. 94.

* Ariſt. Hiſt. an. 892.

This bird is found not only in Britain, but throughout Europe, Aſia, and Africa; as ſpecimens have been received from both China, Bengal, and Egypt. Belon alſo remarks his having met with it in Romania and Greece; and Scopoli notices it as a bird of Carniola, where he ſays it remains the whole year as in England. Indeed it bears the rigours of the colder climates ſo well, that among the Germans it has gained the name of *Eiſzvogel*, or *Ice Bird*: Olina ſpeaks alſo of its not regarding the ice and cold; and Gmelin aſſures us, that it is found even in Tartary and Siberia. But, however this may be, there are few winters in which many of theſe birds do not periſh, apparently from cold alone; as ſeveral have been found frozen ſtiff by the ſides of even running water, without the leaſt mark of violence about them. M. D'Aubenton has kept theſe birds for ſeveral months, by means of ſmall fiſh put into baſons of water, on which they have fed; for on experiment they have refuſed all other kinds of nouriſhment.

2. The rudis, or Egyptian kings-fiſher, as deſcribed by Haſſelquiſt, is the ſize of the Royſton crow. The bill is blackiſh, more than half an inch broad at the baſe, and two inches in length: the head, ſhoulders, and back, are brown, marked with oblong ferruginous ſpots: the throat is of a ferruginous white: the belly and thighs are whitiſh, marked with longitudinal broadiſh cinereous ſpots; upper tail coverts are quite white: the quills ſpotted with white on the inner webs, chiefly at the tips: the tail is aſh-coloured: the legs are of a pale green; and the claws blackiſh. It inhabits lower Egypt, about Cairo; builds in ſycamore and date trees; and feeds on frogs, inſects, and ſmall fiſh, which laſt it meets with in the fields when they are overflowed. Its cry is not unlike that of the common crow.

3. Le taparara of Buffon, is about the ſize of a ſtarling. The upper mandible of the bill is black, the lower red: the hind part of the neck, the back, and ſcapulars, are of an elegant blue; the rump and upper tail coverts bright beryl-blue: the under parts of the body are white; the wing coverts blue; and the legs red. Inhabits Cayenne and Guiana, at which laſt place the natives call all the kings-fiſher tribe by the name *Taparara*. In this part of South America, which contains many rivers full of fiſh, kings-fiſhers, as might be expected, abound in vaſt numbers: but, what is remarkable, they never herd together, always being found ſingle, except in breeding time, which is about the month of September. They lay their eggs in the holes of banks, like the kings-fiſher of Europe. The cry of this bird imitates the word *Carac*.

4. The torquata, or cinereous kings-fiſher, is about the ſize of a magpie, and fifteen inches and a half in length. The bill is three inches and a half long, and brown; the baſe of the lower mandible reddiſh: the head is creſted: the upper parts of the head and body are blueiſh aſh; the under parts cheſtnut: the throat is whitiſh, deſcending down the neck, and paſſing behind like a collar, ending towards the back in a point: the under tail coverts are of a pale fulvous, tranſverſely ſtriated with black: leſſer wing coverts varied with blueiſh, aſh, black, and yellowiſh: the legs are red; and the claws blackiſh. It inhabits Martinico and Mexico; at which laſt it is called *Achalalactli*. This bird migrates into the northern parts of Mexico at certain ſeaſons only, and is ſuppoſed to come there from ſome hotter parts.

[The jacamars are much allied to this genus, and have been ranked under it by Linnæus; Their toes are, however, differently placed; their food alſo is different, being inſects alone, and not fiſh; and their haunts are different, being moiſt woods, and not ſhores or the banks of rivers.]

5. The galbula, or green jacamar, is about the ſize of a lark. The bill is black, of a ſquare form, a little incurvated, and ſharp at the point; the plumage in general, in the upper part of the body, is of a moſt brilliant green, gloſſed with copper and gold in different lights: the belly, throat, and vent, are rufous: the tail is compoſed of ten feathers, and ſhaped like a wedge: the legs are of a greeniſh yellow, very ſhort and weak; the claws are black. This ſpecies is found both in Guiana and Brazil, in the moiſt woods, which it prefers to the more dry ſpots, for the ſake of inſects, on which it feeds. It is ſeldom ſeen except ſingle, as it is a very ſolitary bird, keeping for the moſt part in the thickeſt parts; its flight quick, but ſhort; perches on branches of a middling height, where it ſits all night, and frequently part of the day, without ſtirring. Though theſe birds are ſolitary, yet they are far from ſcarce, as many may be met with. They are ſaid to have a ſhort and agreeable note. The natives of Guiana call this bird *Venctore*, and the Creoles, *Colibri des grands bois*. At Brazil their fleſh is eaten by ſome.

6. The paradiſea, or paradiſe jacamar, is of the ſame ſize as the former, and has a ſimilar bill: the throat, fore part of the neck, and under wing coverts, are white; the reſt of the plumage is of a deep dull green, in ſome lights appearing almoſt black, in others with a ſlight gloſs of violet and copper bronze: the tail is compoſed of twelve feathers of unequal lengths: the two middle ones longeſt: the legs are black: the toes are placed two before and two behind, and pretty much united. It inhabits Surinam; and, like the others, it feeds on inſects; and ſometimes, contrary to them, frequents open places. It flies farther at a time, and perches on the tops of trees: It is frequently found with a companion, not being quite ſo ſolitary a bird as the other. It alſo differs in the note, having a kind of ſoft whiſtle often repeated, but not heard a great way off.

Above 30 other ſpecies have been deſcribed by ornithologiſts.

ALCHEMILLA, or LADY'S-MANTLE: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 35th order *Senticoſæ*. The *calyx* is a ſingle-leav'd perianthium, tubular, and perſiſtent; the mouth flat, and eight-parted: There is no *corolla*. The *ſtamina* conſiſt of four ſmall erect ſubulated filaments placed in the mouth of the calyx; the antheræ are roundiſh: The *piſtillum* has an egg-ſhaped *germen*: The *ſtylus* is filiform, the length of the ſtamina, and inſerted at the baſe of the germ: The *ſtigma* is globular. There is no *pericarpium*, but the neck of the calyx cloſed. The *ſeed* ſolitary, elliptical, and compreſſed. Of this genus there are three

Species. 1. The vulgaris, or common ladies-mantle, with leaves plaited like a fan, and yellowiſh-green bloſſoms. It grows naturally in paſture-lands in moſt of the countries in Europe. The leaves diſcover to the taſte a moderate aſtringency; and were formerly eſteemed in ſome female weakneſſes, and in fluxes of the belly. They are now rarely made uſe of, tho' both the leaves and roots might doubtleſs be of ſervice in caſes where mild aſtringents are required. In the province of Smolandia in Gothland, they make a tincture of the leaves, and give it in ſpaſmodic or convulſive diſeaſes. Horſes, ſheep, and goats, eat it; cows are not fond of it; ſwine refuſe it.—2. The Alpina, or cinque-foil ladies-mantle, with finger-ſhaped ſawed leaves, and greeniſh bloſſoms. It is a native of the mountainous parts of Europe. Goats and cows eat it; horſes, ſheep, and ſwine, refuſe it.—3. The minor, or leaſt ladies-mantle, with five ſmooth leaves growing at a joint and cut into many ſegments. It grows naturally in Sweden, Lapland, and other cold countries. Eaten by cows and goats; refuſed by horſes, ſheep, and ſwine.

Culture. Theſe plants have perennial roots, and annual ſtalks. They are eaſily propagated by parting of their roots, or ſowing their ſeeds in autumn. They ſhould have a moiſt ſoil and ſhady ſituation, and be kept clean from weeds; which is all the culture they require.

ALCHEMIST, a practitioner in alchemy.

ALCHEMY, that branch of chemiſtry which had for its principal objects the tranſmutation of metals into gold; the panacea, or univerſal remedy; an alkaheſt, or univerſal menſtruum; an univerſal ferment; and many other things equally ridiculous.

Kircher, inſtructed in all the ſecrets of chemiſtry, has fully expoſed the artifices and impoſtures of alchemiſts. An alchemiſt puts into a crucible the matter which is to be converted into gold; this he ſets on the fire, blows it, ſtirs it with rods; and, after divers operations, gold is found at the bottom of the crucible, inſtead of the matter firſt put in: this there are a thouſand ways of effecting, without any tranſmutation. Sometimes it is done by dexterouſly dropping in a piece of gold concealed between the fingers, ſometimes by caſting a little of the duſt of gold or ſilver diſguiſed under the appearance of ſome elixir, or other indifferent matter; ſometimes a crucible is uſed which has a double bottom, and gold put between the two; ſometimes the rod uſed to ſtir the matter is hollow, and filled with the duſt of the metal deſired; at other times there is metal mixed with the charcoal, the aſhes of the furnace, or the like. Mr Harris very properly diſtinguiſhes between alchemy and chemiſtry; and defines the former to be *ars ſine arte, cujus principum eſt mentiri, medium laborare, et finis mendicare;* and the Italians have a proverb, *nou ti fidiare al alchemiſta povero o medico amalato.* The ruin which has attended this deluſion, has occaſioned ſeveral ſtates to make ſevere laws againſt pretences to alchemy. The Romans formerly baniſhed all ſuch as profeſſed it; and the ſacred canons likewiſe directed the thunder of their cenſure againſt them. Diocleſian and Cæſar directed all books which treated of this ſubject to be burnt. Rymer furniſhes us with a licence for practiſing alchemy, with all kinds of metals and minerals, granted to one Richard Carter in the year 1476; *Rym. Fœd.* tom. xii. Neverthele ſs, we have had ſevere laws againſt alchemy, and multiplying of metals, as much ſo as againſt coining itſelf.

ALCIAT (Andrew), a great lawyer, who flouriſhed in the 16th century, born at Milan. He mixed much of polite learning in the explication of the laws, and happily drove out the barbarity of language which till then had reigned in the lectures and writings of lawyers; for which Thuanus highly praiſes him. He publiſhed a great many law-books, and ſome notes upon Tacitus. His Emblems have been much admired, and tranſlated into French, Italian, and Spaniſh; and ſeveral learned men have written commentaries on them.

ALCIBIADES, an Athenian general. It was the fate of this great man to live at a time when his country was a ſcene of confuſion. The Greeks, grown inſolent from their conqueſts in Perſia, turned their arms againſt each other, and bandied together under the conduct of the two moſt opulent ſtates Athens and Lacedæmon. Alcibiades, in the midſt of an expedition he had planned againſt the enemy of his country, was recalled home to anſwer ſome charge of a private nature; but fearing the violence of his enemy, inſtead of going to Athens, he offered his ſervices at Sparta, where they were readily accepted. By his advice the Lacedæmonians made a league with Perſia, which gave a very favourable turn to their affairs. But his credit in the republic raiſing jealouſies againſt him, he privately reconciled himſelf to his country, and took again the command of an Athenian army. Here victory, waiting as it were at his command, attended all his motions. The loſs of ſeven battles obliged the Spartans to ſue for peace. He enjoyed his triumphs, however only a ſhort time at Athens. One unſucceſsful event made him again obnoxious to the malice of his citizens; and he found it expedient to retire from Athens. In his abſence the Spartans again took the lead, and at the fatal battle of Ægos entirely ſubdued the Athenian power. Alcibiades, though an exile, endeavoured to reſtore the power of his country; of which the Spartans having intelligence, procured him to be aſſaſſinated. He was a man of admirable accompliſhments, but indifferently principled; of great parts; and of an amazing verſatility of genius.

ALCINOUS, king of the Phænicians, in the iſland now called *Corfu*, was ſon of Nauſithous, and grandſon of Neptune and Peribea. It is by his gardens this king has chiefly immortalized his memory. He received Ulyſſes with much civility, when a ſtorm had caſt him on his coaſt. The people here loved pleaſure and good cheer, yet were ſkilful ſeamen; and Alcinous was a good prince.

ALCMAER, a city in the United Provinces, ſeated in North Holland, about four miles from the ſea, 15 from Haerlem, and 18 from Amſterdam. It is a handſome city, and one of the cleaneſt in Holland. The ſtreets and houſes are extremely neat and regular, and the public buildings very beautiful. It had formerly two pariſh-churches, dedicated to St Mathew and St Lawrence. The latter had ſo high a tower, that it ſerved for a ſea-mark to the veſſels that were in the open ſea; but, in 1464, it tumbled down, and damaged the other church ſo much, that they were both demoliſhed in 1470, and one church was built in their ſtead, dedicated to the ſame ſaints. The Spaniards, under the command of Frederic of Toledo, ſon of the duke d'Alva, came to beſiege it, after they had taken Haerlem in 1573; but were forced to raiſe the ſiege, after three months lying before it, as well on account of the infection of the air as the ſtout reſiſtance of the inhabitants and ſoldiers; even the women ſignalizing themſelves bravely in its defence. It is recorded in the regiſter of this city, that, in the year 1637, 120 tulips, with the off-ſets, ſold for 90,000 florins. The town has a very good trade in butter and cheeſe, of which a vaſt quantity is ſold every year, and is eſteemed the beſt in Holland. E. long. 4. 26. N. lat. 52. 28.

ALCMAN, a lyric poet, who flouriſhed in the 27th Olympiad. He was born at Sparta; and compoſed ſeveral poems, of which only ſome fragments are remaining, quoted by Athenæus and ſome other ancient writers. He was very amorous; accounted the father of gallant poeſy; and is ſaid to have been the firſt that introduced the cuſtom of ſinging love-ſongs in company. He is reported to have been one of the greateſt eaters of his age; upon which Mr Bayle remarks, that ſuch a quality would have been extremely inconvenient, if poetry had been at that time upon ſuch a footing as it has been often ſince, not able to procure the poet bread. He died of a ſtrange diſeaſe; for he was eat up with lice.

ALCMANIAN, in ancient lyric poetry, a kind of verſe conſiſting of two dactyles and two trochees; as,—

Virgini|bus pue|riſque | canto.

The word is formed from *Alcman*, the name of an ancient Greek poet, in great eſteem for his erotics or amorous compoſitions.

ALCMENA, the daughter of Electryo king of Mycenæ, and wife of Amphitrion. Jupiter putting on the ſhape of her huſband while he was abroad in the wars, begot Hercules upon her; he made that night as long as three ordinary ones.

ALCOCK (John), doctor of laws, and biſhop of Ely in the reign of king Henry VII. was born at Beverly in Yorkſhire, and educated at Cambridge. He was firſt made dean of Weſtminſter, and afterwards appointed maſter of the rolls. In 1471, he was conſecrated biſhop of Rocheſter: in 1476, he was tranſlated to the ſee of Worceſter; and in 1486, to that of Ely, in the room of Dr John Morton, preferred to the ſee of Canterbury. He was a prelate of great learning and piety; and ſo highly eſteemed by king Henry, that he appointed him lord preſident of Wales, and afterwards lord chancellor of England. Alcock founded a ſchool at Kingſton upon Hull, and built the ſpacious hall belonging to the epiſcopal palace at Ely. He was alſo the founder of Jeſus-college in Cambridge, for a maſter, ſix fellows, and as many ſcholars. This houſe was formerly a nunnery, dedicated to St Radigund: and as Godwin tells us, the building being greatly decayed, and the revenues reduced almoſt to nothing, the nuns had all forſaken it, except two; whereupon biſhop Alcock procured a grant from the crown, and converted it into a college. But Cambden and others tell us, that the nuns of that houſe were ſo notorious for their incontinence, that king Henry VII. and pope Julius II. conſented to its diſſolution: Bale accordingly calls this nunnery *ſpiritualium meretricum cænobium*, "a community of ſpiritual harlots." Biſhop Alcock wrote ſeveral pieces; amongſt which are the following: 1. *Mons Perfectionis.* 2. *In Pſalmos Penitentiales.* 3. *Homiliæ Vulgares.* 4. *Meditationes Piæ.* He died October 1. 1500; and was buried in the chapel he had built at Kingſton upon Hull.

ALCOHOL, or Alkool, in chemiſtry, ſpirit of wine highly rectified †. It is alſo uſed for any highly rectified ſpirit.—Alcohol is extremely light and inflammable: It is a ſtrong antiſeptic, and thereforc employed to preſerve animal ſubſtances.

Alcohol is alſo uſed for any fine impalpable powder.

ALCOHOLIZATION, the proceſs of rectifying any ſpirit. It is alſo uſed for pulverization.

ALCOR, in aſtronomy, a ſmall ſtar adjoining to the large bright one in the middle of the tail of *urſa major*.—The word is Arabic. It is a proverb among the Arabians, applied to one who pretends to ſee ſmall things, but overlooks much greater: *Thou canſt ſee Alcor, and not yet ſee the full moon.*

ALCORAN, or Al-koran, the ſcripture, or bible, of the Mahometans. The word is compounded of the Arabic particle *al*, and *coran* or *koran*, derived from the verb *caraa* or *karaa*, to read. The word therefore properly ſignifies, *the reading*; or rather, *that which ought to be read.* By this name the Mahometans denote not only the entire book or volume of the Koran, but alſo any particular chapter or ſection of it; juſt as the Jews call either the whole ſcripture, or auy part of it, by the name of *Karah*, or *Mikra*, words of the ſame origin and import.

Beſides this peculiar name, the Koran is alſo honoured with ſeveral appellations common to other books of ſcripture: as, *al Farkan*, from the verb *foraka*, *to divide* or *diſtinguiſh*; not, as the Mahometan doctors ſay, becauſe thoſe books are divided into chapters or ſections, or diſtinguiſhed between good and evil; but in the ſame notion that the Jews uſed the word *Perek* or *Pirka*, from the ſame root, to denote a ſection or portion of ſcripture. It is alſo called *al Moſhaf*, *the volume*, and *al Kitha*, *the book* by way of eminence, which anſwers to the *Biblia* of the Greeks; and *al Dhikr*, *the admonition*, which name is alſo given to the Pentateuch and Goſpel.

The Koran is divided into 114 larger portions of very unequal length, which we call *chapters*; but the Arabians *ſowar*, in the ſingular *ſura*; a word rarely uſed on any other occaſion, and properly ſignifying a row, order, or a regular ſeries; as a courſe of bricks in building, or a rank of ſoldiers in an army; and is the ſame in uſe and import with the Sura, or Tora, of the Jews, who alſo call the fifty-three ſections of the Pentateuch *Sedarim*, a word of the ſame ſignification.

Theſe chapters are not, in the manuſcript copies, diſtinguiſhed by their numerical order, but by particular titles, which are taken ſometimes from a particular matter treated of, or perſon mentioned therein; but uſually from the firſt word of note, exactly in the ſame manner as the Jews have named their Sedarim; though the word from which ſome chapters are denominated be very far diſtant, towards the middle, or perhaps the end, of the chapter; which ſeems ridiculous. But the occaſion of this appears to have been, that the verſe or

† See *Chemiſtry* (Index), and *Pharmacy*.

paſſage wherein ſuch word occurs, was, in point of time, revealed and committed to writing before the other verſes of the ſame chapter which precede it in order; and the title being given to the chapter before it was completed, or the paſſages reduced to their preſent order, the verſe from whence ſuch title was taken did not always happen to begin the chapter. Some chapters have two or more titles, occaſioned by the difference of the copies.

Some of the chapters having been revealed at Mecca, and others at Medina, the noting this difference makes a part of the title: but the reader will obſerve, that ſeveral of the chapters are ſaid to have been revealed partly at Mecca and partly at Medina; and, as to others, it is yet a diſpute among the commentators to which of the two places they belong.

Every chapter is ſubdivided into ſmaller portions, of very unequal length alſo, which we cuſtomarily call *verſes*: but the Arabic word is *ayat*, the ſame with the Hebrew *ototh*, and ſignifies *ſigns* or *wonders*: ſuch as are the ſecrets of God, his attributes, works, judgements, and ordinances, delivered in thoſe verſes; many of which have their particular titles alſo, impoſed in the ſame manner as thoſe of the chapters.

Beſides theſe unequal diviſions of chapter and verſe, the Mahometans have alſo divided their Koran into ſixty equal portions, which they call *Ahzab*, in the ſingular *Hizb*, each ſubdivided into four equal parts; which is alſo an imitation of the Jews, who have an ancient diviſion of their Miſhna into ſixty portions called *Maſſictoth*. But the Koran is more uſually divided into thirty ſections only, named *Ajza*, from the ſingular *Joz*, each of twice the length of the former, and in the like manner ſubdivided into four parts. Theſe diviſions are for the uſe of the readers of the Koran in the royal temples, or in the adjoining chapels where the emperors and great men are interred. There are thirty of theſe readers belonging to every chapel, and each reads his ſection every day; ſo that the whole Koran is read over once a-day.

Next after the title, at the head of every chapter, except only the ninth, is prefixed the following ſolemn form, by the Mahometans called the *Biſmallah*, IN THE NAME OF THE MOST MERCIFUL God; which form they conſtantly place at the beginning of all their books and writings in general, as a peculiar mark or diſtinguiſhing characteriſtic of their religion, it being counted a ſort of impiety to omit it. The Jews, for the ſame purpoſe, make uſe of the form, *In the name of the* LORD, or, *In the name of the great* GOD; and the eaſtern Chriſtians that of, *In the name of the Father, and of the Son, and of the Holy Ghoſt*. But Mahomet probably took this form, as he did many other things, from the Perſian Magi, who uſed to begin their books in theſe words, *Benam Yezdan bakſhaiſhgher dadar*; that is, *In the name of the moſt merciful juſt* GOD.

There are twenty-nine chapters of the Koran, which have this peculiarity, that they begin with certain letters of the alphabet, ſome with a ſingle one, others with more. Theſe letters the Mahometans believe to be the peculiar marks of the Koran, and to conceal ſeveral profound myſteries; the certain underſtanding of which, the more intelligent confeſs, has not been communicated to any mortal, their prophet only excepted. Notwithſtanding which, ſome will take the liberty of gueſſing at their meaning by that ſpecies of Cabala called by the Jews *Notarikon*, and ſuppoſe the letters to ſtand for as many words, expreſſing the names and attributes of God, his works, ordinances, and decrees; and therefore theſe myſterious letters, as well as the verſes themſelves, ſeem in the Koran to be called *ſigns*. Others explain the intent of theſe letters from their nature or origin, or elſe from their value in numbers, according to another ſpecies of the Jewiſh Cabala called *Gematria*; the uncertainty of which conjectures ſufficiently appears from their diſagreement. Thus, for example, five chapters, one of which is the ſecond, begins with theſe letters, A. L. M. which ſome imagine to ſtand for *Allah latiff magid*, "GOD *is gracious and to be glorified*;" or, *Ana li minni*, i. e. *to me and from me*, viz. belongs all perfection, and proceeds all good; or elſe for *Ana Allah alam*, "*I am the moſt wiſe* GOD," taking the firſt letter to mark the beginning of the firſt word, the ſecond the middle of the ſecond word, and the third the laſt of the third word; or for *Allah, Gabriel, Mohammed*, the author, revealer, and preacher of the Koran. Others ſay, that as the letter A belongs to the lower part of the throat, the firſt of the organs of ſpeech; L to the palate, the middle organ; and M to the lips, which are the laſt organ; ſo theſe letters ſignify that God is the beginning, middle, and end, or ought to be praiſed in the beginning, middle, and end, of all our words and actions: or, as the total value of thoſe three letters, in numbers, is ſeventy-one, they ſignify, that, in the ſpace of ſo many years, the religion preached in the Koran ſhould be fully eſtabliſhed. The conjecture of a learned Chriſtian is at leaſt as certain as any of the former, who ſuppoſes thoſe letters were ſet there by the amanuenſis, for *Amar li Mohammed*, i. e. *at the command of Mohammed*, as the five letters prefixed to the nineteenth chapter ſeem to be there written by a Jewiſh ſcribe, for *Coh yaas*, i. e. *Thus he commanded*.

The Koran is univerſally allowed to be written with the utmoſt elegance and purity of language, in the dialect of the tribe of Koreiſh, the moſt noble and polite of all the Arabians, but with ſome mixture, tho' very rarely, of other dialects. It is confeſſedly the ſtandard of the Arabic tongue, and, as the more orthodox believe, and are taught by the book itſelf, inimitable by any human pen (though ſome ſectaries have been of another opinion), and therefore inſiſted on as a permanent miracle, greater than that of raiſing the dead, and alone ſufficient to convince the world of its divine original.

And to this miracle did Mahomet himſelf chiefly appeal for the confirmation of his miſſion, publicly challenging the moſt eloquent men in Arabia, which was at that time ſtocked with thouſands whoſe ſole ſtudy and ambition it was to excel in elegance of ſtyle and compoſition, to produce even a ſingle chapter that might be compared with it (A).

(A) As the compoſition and arrangement of words, however, admit of infinite varieties, it can never be abſolutely ſaid that any one is the beſt poſſible. In fact, Hamzah Benahmed wrote a book againſt the Alcoran with at leaſt equal elegance; and Moſelema another, which even ſurpaſſed it, and occaſioned a defection of a great part the of Muſſulmans. *Journ. de Scav.* tom. xiii. p. 280. *Ouvr. de Scav.* Nov. 1708, p. 404.

To the pomp and harmony of expreſſion ſome aſcribe all the force and effect of the Alcoran; which they conſider as a ſort of muſic, equally fitted with other ſpecies of that art to raviſh and amaze. In this Mahomet ſucceeded ſo well, and ſo ſtrangely captivated the minds of his audience, that ſeveral of his opponents thought it the effect of witchcraft and enchantment, as he himſelf complains.—Others have attributed the effect of the Alcoran to the frequent mention of rewards and puniſhments; heaven and hell occurring almoſt in every page. Some ſuppoſe, that the ſenſual pleaſures of paradiſe, ſo frequently ſet before the imaginations of the readers of the Alcoran, were what chiefly bewitched them. Tho', with regard to theſe, there is a great diſpute whether they are to be underſtood literally or ſpiritually. Several have even allegorized the whole book.

The general deſign of the Koran was to unite the profeſſors of the three different religions, then followed in the populous country of Arabia (who for the moſt part lived promiſcuouſly, and wandered without guides, the far greater number being idolaters, and the reſt Jews and Chriſtians moſtly of erroneous and heterodox belief), in the knowledge and worſhip of one God, under the ſanction of certain laws, and the outward ſigns of ceremonies partly of ancient and partly of novel inſtitution, enforced by the conſideration of rewards and puniſhments both temporal and eternal; and to bring them all to the obedience of Mahomet, as the prophet and ambaſſador of God, who, after the repeated admonitions, promiſes, and threats, of former ages, was at laſt to eſtabliſh and propagate God's religion on earth, and to be acknowledged chief pontiff in ſpiritual matters, as well as ſupreme prince in temporal.

The great doctrine then of the Koran, is the unity of God; to reſtore which point Mahomet pretended was the chief end of his miſſion; it being laid down by him as a fundamental truth, That there never was, nor ever can be, more than one true orthodox religion. For, though the particular laws or ceremonies are only temporary, and ſubject to alteration, according to the divine direction; yet the ſubſtance of it being eternal truth, is not liable to change, but continues immutably the ſame. And he taught, that, whenever this religion became neglected, or corrupted in eſſentials, God had the goodneſs to re-inform and re-admoniſh mankind thereof, by ſeveral prophets, of whom Moſes and Jeſus were the moſt diſtinguiſhed, till the appearance of Mahomet, who is their ſeal, and no other to be expected after him. The more effectually to engage people to hearken to him, great part of the Koran is employed in relating examples of dreadful puniſhments formerly inflicted by God on thoſe who rejected and abuſed his meſſengers; ſeveral of which ſtories, or ſome circumſtances of them, are taken from the Old and New Teſtaments, but many more from the apocryphal books and traditions of the Jews and Chriſtians of thoſe ages, ſet up in the Koran as truths in oppoſition to the ſcriptures, which the Jews and Chriſtians are charged with having altered: and indeed, few or none of the relations or circumſtances in the Koran were invented by Mahomet, as is generally ſuppoſed, it being eaſy to trace the greateſt part of them much higher, as the reſt might be, were more of thoſe books extant, and was it worth while to make the inquiry.

The reſt of the Alcoran is taken up in preſcribing neceſſary laws and directions, frequent admonitions to moral and divine virtues, the worſhip and reverence of the Supreme Being, and reſignation to his will. One of the moſt learned commentators diſtinguiſhes the contents of the Alcoran into *allegorical* and *literal*; under the former are comprehended all the obſcure, parabolical and enigmatical paſſages, with ſuch as are repealed, or abrogated; the latter, ſuch as are clear, and in full force.

The moſt excellent moral in the whole Alcoran, interpreters ſay, is that in the chapter *Al Alraf*, viz. Shew mercy, do good to all, and diſpute not with the ignorant; or, as Mr Sale renders it, Uſe indulgence, command that which is juſt, and withdraw far from the ignorant. Mahomet, according to the authors of the *Keſchaf*, having begged of the angel Gabriel a more ample explication of this paſſage, received it in the following terms: "Seek him who turns thee out, give to "him who takes from thee, pardon him who injures "thee; for God will have you plant in your ſouls the "roots of his chief perfections." It is eaſy to ſee that this commentary is copied from the goſpel.—In reality, the neceſſity of forgiving enemies, though frequently inculcated in the Alcoran, is of a later date among the Mahometans than among the Chriſtians; among thoſe latter, than among the heathens; and to be traced originally among the Jews. (See Exodus xxxiii. 4, 5.) But it matters not ſo much who had it firſt, as who obſerves it beſt. The caliph Haſſan, ſon of Hali, being at table, a ſlave unfortunately let fall a diſh of meat reeking hot, which ſcalded him ſeverely. The ſlave fell on his knees, rehearſing theſe words of the Alcoran, "Paradiſe is for thoſe who reſtrain their "anger." I am not angry with thee, anſwered the caliph.—"And for thoſe who forgive offences againſt them," continues the ſlave. I forgive thee thine, replies the caliph—"But above all, for thoſe who return good for evil," adds the ſlave. I ſet thee at liberty, rejoined the caliph; and I give thee ten dinars.

There are alſo a great number of occaſional paſſages in the Alcoran, relating only to particular emergencies. For this advantage Mahomet had in the piece-meal method of receiving his revelation, that whenever he happened to be perplexed and gravelled with any thing, he had a certain reſource in ſome new morſel of revelation. It was an admirable contrivance of his, to bring down the whole Alcoran at once, only to the loweſt heaven, not to earth; ſince, had the whole been publiſhed at once, innumerable objections would have been made, which it would have been impoſſible for him to ſolve: but as he received it by parcels, as God ſaw fit they ſhould be publiſhed for the converſion and inſtruction of the people, he had a ſure way to anſwer all emergencies, and to extricate himſelf with honour from any difficulty which might occur.

It is the general and orthodox belief among the Mahometans, that the Koran is of divine original; nay, that it is eternal and uncreated, remaining, as ſome expreſs it, in the very eſſence of God: that the firſt tranſcript has been from everlaſting by God's throne, written on a table of vaſt bigneſs, called the *preſerved table*, in which are alſo recorded the divine decrees paſt and future: that a copy from this table, in one volume on paper, was by the miniſtry of the angel Gabriel ſent down to the loweſt heaven, in the month of Ramadan, on the night of *power* : from whence Gabriel revealed it to Mahomet by parcels, ſome at Mecca, and ſome at Medina, at different times, during the ſpace of 23 years, as the exigency of affairs required ; giving him, however, the conſolation to ſhow him the whole (which they tell us was bound in ſilk, and adorned with gold and precious ſtones of paradiſe) once a-year ; but in the laſt year of his life he had the favour to ſee it twice. They ſay, that few chapters were delivered entire, the moſt part being revealed piece meal, and written down from time to time by the prophet's amanuenſis in ſuch a part of ſuch and ſuch a chapter, till they were completed, according to the directions of the angel. The firſt parcel that was revealed is generally agreed to have been the firſt five verſes of the 96th chapter.

After the new-revealed paſſages had been from the prophet's mouth taken down in writing by his ſcribe, they were publiſhed to his followers ; ſeveral of whom took copies for their private uſe, but the far greater number got them by heart. The originals, when returned, were put promiſcuouſly into a cheſt, obſerving no order of time ; for which reaſon it is uncertain when many paſſages were revealed.

When Mahomet died, he left his revelations in the ſame diſorder, and not digeſted into the method, ſuch as it is, in which we now find them. This was the work of his ſucceſſor Abu Becr ; who, conſidering that a great number of paſſages were committed to the memory of Mahomet's followers, many of whom were ſlain in their wars, ordered the whole to be collected, not only from the palm leaves and ſkins on which they had been written, and which were kept between two boards or covers, but alſo from the mouths of ſuch as had gotten them by heart. And this tranſcript, when completed, he committed to the cuſtody of Haſſa the daughter of Omar, one of the prophet's widows.

From this relation it is generally imagined that Abu Becr was really the compiler of the Koran ; though, for aught appears to the contrary, Mahomet left the chapters complete as we now have them, excepting ſuch paſſages as his ſucceſſor might add or correct from thoſe who had gotten them by heart ; what Abu Becr did elſe, being perhaps no more than to range the chapters in their preſent order, which he ſeems to have done without any regard to time, having generally placed the longeſt firſt.

However, in the 30th year of the Hegira, Othman being then caliph, and obſerving the great diſagreement in the copies of the Koran in the ſeveral provinces of the empire ; thoſe of Irak, for example, following the reading of Abu Muſa al Aſhari, and the Syrians that of Macdad Ebn Aſwad ; he, by the advice of the *companions*, ordered a great number of copies to be tranſcribed from that of Abu Becr, in Haſſa's care, under the inſpection of Zeid Ebn Thabet, Abd'allah Ebn Zobair, Said Ebn al As, and Ad'alrahman Ebn al Hareth the Makhzumite ; whom he directed, that, wherever they diſagreed about any word, they ſhould write it in the dialect of the Koreiſh, in which it was at firſt delivered. Theſe copies, when made, were diſperſed in the ſeveral provinces of the empire, and the old ones burnt and ſuppreſſed. Though many things in Haſſa's copy were corrected by the abovementioned reviſers, yet ſome few various readings ſtill occur.

In fine, the book of the Alcoran is held in the higheſt eſteem and reverence among the Muſſulmans. They dare not ſo much as touch the Alcoran without being firſt waſhed, or legally purified ; to prevent which, an inſcription is put on the cover or label, *Let none touch but they who are clean.* It is read with great care and reſpect ; being never held below the girdle. They ſwear by it ; take omens from it on all weighty occaſions ; carry it with them to war ; write ſentences of it in their banners ; adorn it with gold and precious ſtones ; and knowingly ſuffer it not to be in the poſſeſſion of any of a different religion. Some ſay that it is puniſhable even with death, in a Chriſtian to touch it ; others, that the veneration of the Muſſulmans leads them to condemn the tranſlating it into any other language as a profanation : but theſe ſeem to be aggravations. The Mahometans have taken care to have their ſcripture tranſlated into the Perſian, the Javan, the Malayan, and other languages ; though, out of repect to the original, theſe verſions are generally, if not always interlineated.

By the advocates of Mahometaniſm, the Koran, as already obſerved, has always been held forth as the greateſt of miracles, and equally ſtupendous with the act of raiſing the dead. The miracles of Moſes and Jeſus, they ſay, were tranſient and temporary ; but that of the Koran is permanent and perpetual ; and therefore far ſurpaſſes all the miraculous events of preceding ages. We will not detract from the real merit of the Koran : we allow it to be generally elegant, and often ſublime : but at the ſame time we reject with diſdain its arrogant pretence to any thing ſupernatural ; all the real excellence of the work being eaſily referable to natural and viſible cauſes.

View of Chriſtianity and Mahometaniſm, p. 257.

" In the language of Arabia, a language extremely loved and diligently cultivated by the people to whom it was vernacular, Mahomet found advantages which were never enjoyed by any former or preceding impoſtor. It requires not the eye of a philoſopher to diſcover in every ſoil and country a principle of national pride : and if we look back for many ages to the hiſtory of the Arabians, we ſhall eaſily perceive that pride among them invariably to have conſiſted in the knowledge and improvement of their native language. The Arabic, which has been juſtly eſteemed the moſt copious of the Eaſtern tongues ; which had exiſted from the remoteſt atiquity ; which had been embelliſhed by numberleſs poets, and refined by the conſtant exerciſe of the natives ; was the moſt ſuccesſful inſtrument which Mahomet employed in planting his new religion among them. Admirably adapted by its unrivalled harmony, and by its endleſs variety to add painting to expreſſion, and to purſue the imagination in its unbounded flight ; it became in the hands of Mahomet an irreſiſtable charm to blind the judgment, and to captivate the fancy of his followers.

" Of that deſcription of men who firſt compoſed the adherents of Mahomet, and to whom the Koran was addreſſed, few, probably, were able to paſs a very accurate judgment on the propriety of the ſentiments, or on the beauties of the diction : but all could judge of the military abilities of their leader ; and in the midſt of their admiration it is not difficult to conceive, that they would aſcribe to his compoſitions every imaginary beauty of inſpired language.

" The ſhepherd and the ſoldier, though awake to the charms of thoſe wild but beautiful compoſitions, in which were celebrated their favourite occupations of love or war, were yet little able to criticiſe any other works than thoſe which were addreſſed to their imagination or the heart. To abſtract reaſonings on the attributes and the diſpenſations of the Deity, to the comparative excellencies of rival religions, to the conſiſtency of any one religious ſyſtem in all its parts, and to the force of its various proofs, they were quite inattentive. In ſuch a ſituation, the appearance of a work which poſſeſſed ſomething like wiſdom and conſiſtence; which preſcribed the rules, and illuſtrated the duties of life; and which contained the principles of a new and comparatively ſublime theology, independently of its real and permanent merit, was likely to excite their aſtoniſhment and to become the ſtandard of future compoſition.

“In the firſt periods of literature of every country, ſomething of this kind has happened. The father of Grecian poetry very obviouſly influenced the taſte and imitation of his countrymen. The modern nations of Europe all poſſeſs ſome original author, who, riſing from the darkneſs of former ages, has begun the career of compoſition, and tinctured with the character of his own imagination the ſtream which has flowed through his poſterity.

“But the prophet of Arabia had in this reſpect advantages peculiar to himſelf. His compoſitions were not to his followers the works of man, but the genuine language of Heaven, which had ſent him. They were not confined therefore to that admiration which is ſo liberally beſtowed on the earlieſt production of genius, or to that fond attachment with which men every where regard the original compoſitions of their country: but with their admiration they blended their piety. To know and to feel the beauties of the Koran, was in ſome reſpect to ſhare in the temper of Heaven; and he who was moſt affected with admiration in the peruſal of its beauties, ſeemed moſt fitly the object of that mercy which had given it to ignorant man. The Koran, therefore, became naturally and neceſſarily the ſtandard of taſte. With a language thus hallowed in their imaginations, they were too well ſatisfied, either to diſpute its elegance or improve its ſtructure. In ſucceeding ages, the additional ſanction of antiquity, or preſcription, was given to theſe compoſitions which their fathers had admired: and while the belief of its divine original continues, that admiration, which has thus become the teſt and the duty of the faithful, can neither be altered nor diminiſhed.

“When therefore we conſider theſe peculiar advantages of the Koran, we have no reaſon to be ſurpriſed at the admiration in which it is held. But if, deſcending to a more minute inveſtigation of it, we conſider its perpetual inconſiſtence and abſurdity, we ſhall indeed have cauſe for aſtoniſhment at that weakneſs of humanity which could ever have received ſuch compoſitions as the work of the Deity.

“The firſt praiſe of all the productions of genius, is invention; that quality of the mind, which, by the extent and quickneſs of its views, is capable of the largeſt conceptions, and of forming new combinations of objects the moſt diſtant and unuſual. But the Koran bears little impreſſion of this tranſcendent character. Its materials are wholly borrowed from the Jewiſh and Chriſtian ſcriptures, from the Talmudical legends and apocryphal goſpels then current in the Eaſt, and from the traditions and fables which abounded in Arabia. The materials collected from theſe ſeveral ſources are here heaped together, with perpetual and needleſs repetitions, without any ſettled principle or viſible connection.

“When a great part of the life of Mahomet had been ſpent in preparatory meditation on the ſyſtem he was about to eſtabliſh, its chapters were dealt out ſlowly and ſeparately during the long period of 23 years. Yet thus defective in its ſtructure, and not leſs exceptionable in its doctrines, was the work which Mahomet delivered to his followers as the oracles of God.

“The moſt prominent feature of the Koran, that point of excellence in which the partiality of its admirers has ever delighted to view it, is the ſublime notion it generally impreſſes of the nature and attributes of God. If its author had really derived theſe juſt conceptions from the inſpiration of that Being whom they attempt to deſcribe, they would not have been ſurrounded, as they now are on every ſide, with error and abſurdity. But it might eaſily be proved, that whatever it juſtly defines of the divine attributes, was borrowed from our holy ſcriptures; which even from its firſt promulgation, but eſpecially from the completion of the New Teſtament, has extended the views and enlightened the underſtandings of mankind; and thus furniſhed them with arms which have too often been ineffectually turned againſt itſelf by its ungenerous enemies.

“In this inſtance particularly, the copy is far below the great original, both in the propriety of its images, and the force of its deſcriptions. Our holy ſcriptures are the only compoſitions that can enable the dim ſight of mortality to penetrate into the inviſible world, and to behold a glimpſe of the Divine perfections. Accordingly, when they would repreſent to us the happineſs of Heaven, they deſcribe it not by any thing minute and particular, but by ſomething general and great; ſomething, that without deſcending to any determinate object, may at once by its beauty and immenſity excite our wiſhes and elevate our affections. Though in the prophetical and evangelical writings the joys that ſhall attend us in a future ſtate are often mentioned with ardent admiration, they are expreſſed rather by alluſion than ſimilitude, rather by indefinite and figurative terms, than by any thing fixed and determinate. ‘Eye hath not ſeen, nor ear heard, neither hath it entered into the heart of man, the things which God hath prepared for them that love him’. 1 *Cor.* ii. 9. What a reverence and aſtoniſhment does this paſſage excite in every hearer of taſte and piety? What energy, and at the ſame time what ſimplicity, in the expreſſion? How ſublime, and at the ſame time how obſcure, is the imagery?

“Different was the conduct of Mahomet in his deſcriptions of heaven and of paradiſe. Unaſſiſted by the neceſſary influence of virtuous intentions and divine inſpiration, he was neither deſirous, nor indeed able to exalt the minds of men to ſublime conceptions, or to rational expectations. By attempting to explain what is inconceivable, to deſcribe what is ineffable, and to materialize what in itſelf is ſpiritual; he abſurdly and impiouſly aimed to ſenſualize the purity of the Divine eſſence. Thus he fabricated a ſyſtem of incoherence, a religion of depravity, totally repugnant indeed to the nature of that Being, who, as he pretended, was its object; but therefore more likely to accord with the appetites and conceptions of a corrupt and ſenſual age.

"That we may not appear to exalt our Scriptures thus far above the Koran by an unreaſonable preference, we ſhall produce a part of the ſecond chapter of the latter, which is deſervedly admired by the Mahometans, who wear it engraved on their ornaments, and recite it in their prayers. 'God! there is no God but he; the living, the ſelf-ſubſiſting: neither ſlumber nor ſleep ſeizeth him: to him belongeth whatſoever is in heaven, and on earth. Who is he that can intercede with him but through his good pleaſure? He knoweth that which is paſt, and that which is to come. His throne is extended over heaven and earth, and the preſervation of both is to him no burden. He is the high, the mighty.' *Sale's Kor.* ii. p. 30. 4to edit.

"To this deſcription who can refuſe the praiſe of magnificence? Part of that magnificence, however, is to be referred to that verſe of the Pſalmiſt, whence it was borrowed, 'He that keepeth Iſrael, ſhall neither ſlumber nor ſleep.' *Pſal.* cxxi. 4.

"But if we compare it with that other paſſage of the ſame inſpired Pſalmiſt, all its boaſted grandeur is at once obſcured, and loſt in the blaze of a greater light.

"O my God, take me not away in the midſt of my days; thy years are throughout all generations. Of old haſt thou laid the foundations of the earth; and the heavens are the work of thy hands. They ſhall periſh, but thou ſhalt endure: yea all of them ſhall wax old, as doth a garment; as a veſture ſhalt thou change them, and they ſhall be changed; but thou art the ſame, and thy years ſhall not fail.'

"The Koran, therefore, upon a retroſpective view of theſe ſeveral circumſtances, far from ſupporting its arrogant claim to a ſupernatural work, ſinks below the level of many compoſitions confeſſedly of human original; and ſtill lower does it fall in our eſtimation, when compared with that pure and perfect pattern which we juſtly admire in the ſcriptures of truth.

"It is therefore abundantly apparent, that no miracle either was externally performed for the ſupport, or is internally involved in the compoſition, of the Mahometan revelation."

ALCORAN, is alſo figuratively applied to certain other books full of impieties and impoſtures.—In this ſenſe we meet with the *Alcoran* of the Cordeliers, which has made a great noiſe; wherein St Francis is extravagantly magnified, and put on a level with Jeſus Chriſt. The Alcoran of the Cordeliers is properly an extract of a very ſcarce book, entitled, The conformity of the life of the ſeraphic father St Francis with the life of Chriſt, publiſhed in 1500, 4to; ſince, at Bologna, in folio. Eraſmus Albertus, being by the elector of Brandenburg appointed to viſit a monaſtery of Franciſcans, found this book; and being ſtruck with the extreme folly and abſurdity of it, collected a number of curioſities out of it, and publiſhed them under the title of the *Alcoran* of the Franciſcans, with a preface by Martin Luther.

ALCORANISTS, among Mahometans, thoſe who adhere ſtrictly to the letter or text of the alcoran, from an opinion of its ultimate ſufficiency and perfection. The Perſians are generally *Alcoraniſts*, as admitting the Alcoran alone for their rule of faith. The Turks, Tartars, Arabs, &c. beſides the Alcoran, admit a multitude of traditions. The Alcoraniſts, among Mahometans, amount to much the ſame with the textuaries among the Jews. The Alcoraniſts can find nothing excellent out of the Alcoran; are enemies of philoſophers, metaphyſicians, and ſcholaſtic writers. With them the Alcoran is every thing.

ALCOVE, among builders, a receſs, or part of a chamber ſeparated by an eſtrade, or partition of columns, and other correſponding ornaments, in which is placed a bed of ſtate, and ſometimes ſeats to entertain company. Theſe alcoves are frequent in Spain; and the bed is raiſed two or three aſcents, with a rail at the foot.

ALCUINUS (Flaccus), an eccleſiaſtic of the eighth century. Where he was born, is a matter of diſpute; but, according to the moſt probable opinion, it was in Yorkſhire. It is pretty certain, however, that he was educated at York, under the direction of archbiſhop Egbert, as we learn from his own letters, in which he frequently calls that great prelate his beloved maſter, and the clergy of York the companions of his youthful ſtudies. As he ſurvived venerable Bede about 70 years, it is hardly poſſible that he could have received any part of his education under him, as ſome writers of literary hiſtory have affirmed; and it is worthy of obſervation, that he never calls that great man his maſter, though he ſpeaks of him with the higheſt veneration. It is not well known to what preferments he had attained in the church before he left England, though ſome ſay he was abbot of Canterbury. The occaſion of his leaving his native country, was his being ſent on an embaſſy by Offa king of Mercia to the emperor Charlemagne; who contracted ſo great an eſteem and friendſhip for him, that he earneſtly ſolicited, and at length prevailed upon him, to ſettle in his court, and become his preceptor in the ſciences. Alcuinus accordingly inſtructed that great prince in rhetoric, logic, mathematics, and divinity; which rendered him one of his greateſt favourites. "He was treated with ſo much kindneſs and familiarity (ſays a cotemporary writer) by the Emperor, that the other courtiers called him, by way of eminence, *the emperor's delight.*" Charlemagne employed his learned favourite to write ſeveral books againſt the heretical opinions of Felix Biſhop of Urgel in Catalonia, and to defend the orthodox faith againſt that hereſiarch, in the council of Francfort, A. D. 894; which he performed to the entire ſatisfaction of the Emperor and council, and even to the conviction of Felix and his followers, who abandoned their errors. The Emperor conſulted chiefly with Alcuinus on all things relating to religion and learning; and, by his advice, did many great things for the advancement of both. An academy was eſtabliſhed in the Imperial palace, over which Alcuinus preſided, and in which the princes and prime nobility were educated; and other academies were eſtabliſhed in the chief towns of Italy and France, at his inſtigation, and under his inſpection. "France (ſays one of our beſt writers of literary hiſtory) is indebted to Alcuinus for all the polite learning it boaſted of in that and the following ages. The univerſities of Paris, Tours, Fuldon, Soiſſons, and many others, owe to him their origin and increaſe; thoſe of whom he was not the ſuperior and founder, being at leaſt enlightened by his doctrine and example, and enriched by the benefits he procured for them from Charlemagne." After Alcuinus had ſpent many years in the moſt intimate familiarity with the greateſt prince of his age, he at length, with great difficulty, obtained leave to retire from court to his abbey of St Martin's at Tours. Here he kept up a conſtant correſpondence by letters with Charlemagne; from which it appears, that both the emperor and his learned friend were animated with the moſt ardent love to learning and religion, and conſtantly employed in contriving and executing the nobleſt deſigns for their advancement. He compoſed many treatiſes on a great variety of ſubjects, in a ſtyle much ſuperior in purity and elegance to that of the generality of writers in the age in which he flouriſhed. Charlemagne often ſolicited him, with all the warmth of a moſt affectionate friend, to return to court, and favour him with his company and advice; but he ſtill excuſed himſelf; and nothing could draw him from his retirement in his abbey of St Martin in Tours, where he died A. D. 904. His works were collected and publiſhed by Andrew du Cheſne in one volume folio, Paris, 1617. They conſiſt of, 1. Tracts upon ſcripture. 2. Tracts upon doctrine, diſcipline, and morality. 3. Hiſtorical treatiſes, letters, and poems. Since that edition, there has been publiſhed an incredible number of tracts, poems, &c. aſcribed to this author, moſt of which, in all probability, were not his.

ALCYON, the trivial name of a ſpecies of alcedo. See ALCEDO.

ALCYONIUM, an obſolete name of a ſubmarine plant. It is alſo uſed for a kind of coral, or aſtroites, frequently found foſſile in England.

ALCYONIUM *Stagnum* (anc. geog.), a lake in the territory of Corinth, whoſe depth was unfathomable, and in vain attempted to be diſcovered by Nero. Thro' this lake Bacchus is ſaid to have deſcended to hell, to bring back Semele; (Pauſanias).

ALCYONIUS (Peter), a learned Italian, who flouriſhed in the 16th century. He was well verſed in the Greek and Latin tongues, and wrote ſome pieces of eloquence which met with great approbation. He was corrector of the preſs a conſiderable time for Aldus Manutius, and is intitled to a ſhare in the praiſes given to the editions of that learned printer. He publiſhed a treatiſe concerning baniſhment, which contained ſo many fine paſſages intermixed with others quite the reverſe, that is was thought he had tacked to ſomewhat of his own, ſeveral fragments of a treatiſe of *Cicero de gloria;* and that afterwards, in order to ſave himſelf from being detected in this theft, he burnt the manuſcript of Cicero, the only one extant. Paulus Manutius, in his commentary upon theſe words of Cicero, *Librum tibi celeriter mittam de gloria,* "I will ſpeedily ſend you my treatiſe on glory;" has the following paſſage relating to this affair: "He means (ſays he) his two books On Glory, which were handed down to the age of our fathers; for Bernard Juſtinian, in the index of his books, mentions *Cicero de Gloria.* This treatiſe, however, when Bernard had left his whole library to a nunnery, could not be found, though ſought after with great care: nobody doubted but Peter Alcyonius, who, being phyſician to the nunnery, was entruſted with the library, had baſely ſtole it. And truely, in his treatiſe Of Baniſhment, ſome things are found interſperſed here and there, which ſeem not to ſavour of Alcyonius, but of ſome higher author." The two orations he made after the taking of Rome, wherein he repreſented very ſtrongly the injuſtice of Charles V. and the barbarity of his ſoldiers, were excellent pieces. There is alſo an oration aſcribed to him, on the knights who died at the ſiege of Rhodes.

ALDBOROUGH, a ſea-port town in Suffolk, with a market on Saturdays. It is pleaſantly ſituated, in a dale, between a high hill to the weſtward, on which its large old-built church ſtands; the ſea to the eaſt, and its river running ſouth-weſt. It is a large, long, ordinary town, made up of two or three ſtreets of low houſes, running parallel to each other. A quarter of a mile to the ſouth lies Slaughden, where they have a commodious key, with warehouſes for fiſh: more ſoutherly ſtill, they have conveniences for drying their north-ſea fiſh. Their employment in the fiſhery is their chief buſineſs, which is conſiderable in the ſeaſons for catching herrings and ſprats; and it is the only place in England for curing red ſprats. It is a town corporate, and ſends two members to parliament. Towards the ſea, it has ſome pieces of cannon planted for its defence. It is 88 miles north-eaſt from London. E. Long. 1. 32. N. Lat. 52. 50.

ALDBOROUGH, a market-town in the weſt riding of Yorkſhire, ſeated on the river Ouſe, 15 miles north-weſt of York, and 200 miles north of London. It ſends two members to parliament. W. Long. 0. 20. N. Lat. 54. 15. It was anciently a Roman city, called *Iſurium Brigantium;* and ſeveral coins and monuments of the Saxons and Romans have been diſcovered there.

ALDEBARAN, in aſtronomy, a ſtar of the firſt magnitude, called in Engliſh the *bull's eye,* as making the eye of the conſtellation Taurus. Its longitude is 6 deg. 32 min. 9 ſec. of Gemini, and its latitude 5 deg. 29 min. 40 ſec. ſouth.

ALDER-TREE, in botany. See BETULA.

ALDERHOLM, a pleaſant iſland of Sweden, formed by the three arms of a river running thro' Gentle, a town of Nordland, in Sweden. Here is a wharf, a repoſitory for planks and deals, two packing houſes, a large cuſtomhouſe for taking toll of the ſhips, an arſenal for cannon, and a granary.

ALDERMAN, in the Britiſh policy, a magiſtrate ſubordinate to the lord-mayor of a city or town-corporate. The number of theſe magiſtrates is not limited, but is more or leſs according to the magnitude of the place. In London they are 26; each having one of the wards of the city committed to his care. This office is for life; ſo that when one of them dies, or reſigns, a ward-mote is called, who return two perſons, one of whom the lord-mayor and aldermen chooſe to ſupply the vacancy. All the aldermen are juſtices of the peace, by a charter of 15 Geo. II. The aldermen of London, &c. are exempted from ſerving inferior offices; nor ſhall they be put upon aſſizes, or ſerve on juries, ſo long as they continue to be aldermen.

ALDERMAN, among the ancient Saxons, was a degree of nobility anſwering to earl or count at preſent.

ALDERMAN was alſo uſed, in the time of king Edgar, for a judge or juſtice. Thus we meet with the titles of *Aldermannus totius Angliæ, aldermannus regis, comitatus civitatis, burgi, caſtelli, hundredi ſive wapentachii, et novemdecimorum.* According to Spelman, the *aldermannus totius Angliæ* ſeems to have been the ſame officer who was afterwards ſtyled *capitalis juſticiarius Angliæ*, or chief-juſtice of England; the *aldermannus regis* ſeems to have been an occaſional magiſtrate, anſwering to our juſtice of aſſize; and the *aldermannus comitatus*, a magiſtrate who held a middle rank between what was afterwards called the *earl* and the *ſheriff;* he ſat at the trial of cauſes with the biſhop: the latter proceeding according to eccleſiaſtical law, and the former declaring and expounding the common law of the land.

ALDERNEY, an iſland in the Britiſh channel, ſubject to the crown of Great Britain. It is about eight miles in compaſs, and is ſeparated from Cape la Hogue, in Normandy, by a narrow ſtreight, called the *Race of Alderney*, which is a very dangerous paſſage in ſtormy weather when the two currents meet; otherwiſe it is ſafe, and has depth of water for the largeſt ſhips. Thro' this ſtreight the French fleet made their eſcape after their defeat at La Hogue, in 1692. It is a healthy iſland, has but one church, is fruitful both in corn and paſture, and is remarkable for a fine breed of cows. The inhabitants, for their greater ſafety, live together in a town of the ſame name. The number of houſes are ſaid to be 200, and the inhabitants 1000. It has but one harbour, called *Crabby*, which is at a good diſtance from the town; and is only fit for ſmall veſſels. To the weſt lie the range of rocks called the *Caſkets*, ſo dangerous to mariners. W. Long. 2. 17. N. Lat. 49. 50.

ALDHELM (St), biſhop of Shereburn in the time of Saxon Heptarchy. He is ſaid to have been the ſon of Kenred, brother to Ina, king of the Weſt-Saxons; but, in the opinion of William of Malmſbury, his father was no more than a diſtant relation to the king. Having received the firſt part of his education in the ſchool which one Macdulf, a learned Scot, had ſet up in the place where Malmſbury now ſtands, he travelled into France and Italy for his improvement. At his return home, he ſtudied ſome time under Adrian abbot of St Auguſtine's in Canterbury, the moſt learned profeſſor of the ſciences who had ever been in England. In theſe different ſeminaries he acquired a very uncommon ſtock of knowledge; and became famous for his learning, not only in England, but in foreign countries: whence ſeveral learned men ſent him their writings for his peruſal and correction; particularly Prince Arcivil, a ſon of the king of Scotland, who wrote many pieces which he ſent to Aldhelm, "intreating him to give them the laſt poliſh, by rubbing off their Scots ruſt." He was the firſt Engliſhman who wrote in the Latin language both in proſe and verſe, and compoſed a book for the inſtruction of his countrymen in the proſody of that language. Beſides this, he wrote ſeveral other treatiſes on various ſubjects; ſome of which are loſt, and others publiſhed by Martin Delrio and Caniſius. Venerable Bede, who flouriſhed in the end of this and the beginning of the next century, gives the following character of Aldhelm: "He was a man of univerſal erudition, having an elegant ſtyle, and being wonderfully well acquainted with books, both on philoſophical and religious ſubjects." In fact, conſidering the cloud of ignorance by which he was ſurrounded, and the great difficulty of acquiring knowledge without proper inſtruction, Aldhelm was a very extraordinary man. From one of his letters to Hedda biſhop of Wincheſter, concerning the nature of his ſtudies whilſt at Canterbury, he appears to have been indefatigably determined to acquire every ſpecies of learning in his power. For a copy of this curious epiſtle, ſee Henry's Hiſtory, vol. ii. p. 320. King Alfred the Great declared, that Aldhelm was the beſt of all the Saxon poets; and that a favourite ſong, which was univerſally ſung in his time, near 200 years after its author's death, was of his compoſition. When he was abbot of Malmſbury, having a fine voice, and great ſkill in muſic as well as poetry, and obſerving the backwardneſs of his barbarous country men to liſten to grave inſtructions, he compoſed a number of little poems, which he ſung to them after maſs in the ſweeteſt manner; by which they were gradually inſtructed and civilized. After this excellent perſon had governed the monaſtery of Malmſbury, of which he was the founder, about 30 years, he was made biſhop of Shereburn, where he died A. D. 709.—He wrote, 1. *De octo vitiis principalibus.* This treatiſe is extant in *Bibliotheca Patrum* of Caniſius. 2. *Ænigmaticum verſus mille.* This, with ſeveral other of his poems, was publiſhed by Martin Delrio at Mentz, 8vo, 1601. 3. A book addreſſed to a certain king of Northumberland, named Alfrid, on various ſubjects. 4. *De vita monachorum.* 5. *De laude ſanctorum.* 6. *De arithmetica.* 7. *De aſtrologia.* 8. A book againſt the miſtake of the Britons concerning the celebration of Eaſter; printed by Sonius, 1576. 9. *De laude virginitatis.* Manuſcript, in Bennet-college, Cambridge. Publiſhed among Bede's *Opuſcula.* Beſides many ſonnets, epiſtles, and homilies in the Saxon language.

ALDPORT, an ancient name for Mancheſter. See MANCHESTER.

ALDRED, abbot of Taviſtock, was promoted to the biſhopric of Worceſter in the year 1046. He was ſo much in favour with King Edward the Confeſſor, and had ſo much power over his mind, that he obliged him to be reconciled with the worſt of his enemies, particularly with Swane ſon of the earl Goodwin, who had revolted againſt him, and came with an army to invade the kingdom. Aldred alſo reſtored the union and friendſhip between king Edward and Griffin king of Wales. He took afterwards a journey to Rome, and being returned into England, in the year 1054, he was ſent ambaſſador to the emperor Henry II.; he ſtaid a whole year in Germany, and was very honourably entertained by Herman archbiſhop of Cologn, from whom he learned many things relating to eccleſiaſtical diſcipline, which on his return he eſtabliſhed in his own dioceſe. In the year 1058 he went to Jeruſalem, which no archbiſhop or biſhop of England had ever done before him. Two years after he returned to England; and Kinſius archbiſhop of York dying the 22d of December 1060, Aldred was elected in his ſtead on Chriſtmas day following, and thought fit to keep his biſhoprick of Worceſter with the archbiſhoprick of Canterbury, as ſome of his predeceſſors had done. Aldred went ſoon after to Rome, in order to receive the Pallium from the Pope: He was attended by Toſtou earl of Northumberland, Giſo biſhop of Wells, and Walter biſhop of Hereford. The Pope received Toſton very honourably, and made him ſit by him in the ſynod which he held againſt the Simoniſts. He granted to Giſo and Walter their requeſt, becauſe they were tolerably well learned, and not accuſed of ſimony. But Aldred being by his anſwers found ignorant, and guilty of ſimony, the pope deprived him very ſeverely of all honours and dignities; ſo that he was obliged to return without the Pallium. On his way home he and his three fellow-travellers were attacked by ſome robbers, who took from them all that they had, though they did not offer to kill them. This obliged them to return to Rome: and the pope, either out of compaſſion, or by the threatenings of the earl of Northumberland, gave Aldred the Pallium; but he was obliged to reſign his biſhopric of Worceſter. However, as the archbiſhopric of York had been almoſt entirely ruined by the many invaſions of foreigners, king Edward gave the new archbiſhop leave to keep twelve villages of manors which belonged to the biſhopric of Worceſter. Edward the Confeſſor dying in 1066, Aldred crowned Harold his ſucceſſor. He alſo crowned William the Conqueror, after he had made him take the following oath, viz. that he would protect the holy church of God and their leaders; that he would eſtabliſh and obſerve righteous laws; that he would entirely prohibit and ſuppreſs all rapines and unjuſt judgments. He was ſo much in favour with the Conqueror, that this prince looked upon him as a father; and, though imperious in regard to every body elſe, he yet ſubmitted to obey this archbiſhop: John Bromton gives us an inſtance of the king's ſubmiſſion, which at the ſame time ſhows the prelate's haughtineſs.—It happened one day, as the archbiſhop was at York, that the deputy-governor or lord-lieutenant going out of the city with a great number of people, met the archbiſhop's ſervants, who came to town with ſeveral carts and horſes loaded with proviſions. The governor aſked them to whom they belonged; and they having anſwered they were Aldred's ſervants, the governor ordered that all theſe proviſions ſhould be carried to the king's ſtore-houſe. The archbiſhop ſent immediately ſome of his clergy to the governor, commanding him to deliver the proviſions, and to make ſatisfaction to St Peter, and to him the ſaint's vicar, for the injury he had done them; adding, that if he refuſed to comply, the archbiſhop would make uſe of his apoſtolic authority againſt him, (intimating thereby that he would excommunicate him). The governor, offended at this proud meſſage, uſed the perſons whom the archbiſhop had ſent him very ill, and returned an anſwer as haughty as the meſſage was. Aldred thereupon went to London to make his complaint to the king; but in this very complaint he acted with his wonted inſolence; for meeting the king in the church of St Peter at Weſtminſter, he ſpoke to him in theſe words. "Hearken, O William: when thou waſt but a foreigner, and God, to puniſh the ſins of this nation, permitted thee to become maſter of it, after having ſhed a great deal of blood, I conſecrated thee, and put the crown upon thy head with bleſſings; but now, becauſe thou haſt deſerved it, I pronounce a curſe over thee, inſtead of a bleſſing, ſince thou art become the perſecutor of God's church, and of his miniſters, and haſt broken the promiſes and the oaths which thou madeſt to me before St Peter's altar." The king, terrified at this diſcourſe, fell upon his knees, and humbly begged the prelate to tell him, by what crime he had deſerved ſo ſevere a ſentence. The noblemen, who were preſent, were enraged againſt the archbiſhop, and loudly cried out he deſerved death, or at leaſt baniſhment, for having offered ſuch an injury to his ſovereign, and they preſſed him with threatenings to raiſe the king from the ground. But the prelate, unmoved at all this, anſwered calmly, "Good men, let him lie there, for he is not at Aldred's but at St Peter's feet; he muſt feel St Peter's power, ſince he dared to injure his vicegerent." Having thus reproved the nobles by his epiſcopal authority, he vouchſafed to take the king by the hand, and to tell him the ground of his complaint. The king humbly excuſed himſelf, by ſaying he had been ignorant of the whole matter; and begged of the noblemen to intreat the prelate, that he might take off the curſe he had pronounced, and to change it into a bleſſing. Aldred was at laſt prevailed upon to favour the king thus far; but not without the promiſe of ſeveral preſents and favours, and only after the king had granted him to take ſuch a revenge on the governor as he thought fit. Since that time (adds the hiſtorian) none of the noblemen ever dared to offer the leaſt injury. It may be queſtioned, which was more ſurpriſing here, whether the archbiſhop's haughtineſs, who dared to treat his ſovereign after ſo unbecoming a manner; or the king's ſtupidity, who ſuffered ſuch inſolence and audaciouſneſs from a prieſt?—The Danes having made an invaſion in the north of England in the year 1068, under the conduct of Harold and Canute the ſons of king Swane, Aldred was ſo much afflicted at it, that he died of grief the 11th of September in that ſame year, having beſought God that he might not ſee the deſolation of his church and country.

ALDRICH (Robert), biſhop of Carliſle, was born at Burnham in Buckinghamſhire about the year 1493, and educated at Eaton-ſchool; from whence, in 1507, he was elected ſcholar of King's-college, Cambridge, where he took his degree in arts, and was afterwards proctor of the univerſity. In 1525, he was appointed maſter of Eaton ſchool, then became fellow of that college, and finally provoſt. In 1529, he went to Oxford, where, being firſt incorporated bachelor of divinity, in the following year he proceeded doctor in that faculty: in 1531, he was made arch-deacon of Colcheſter; in 1534, canon of Windſor; and the ſame year, regiſtrary of the order of the garter. He was conſecrated biſhop of Carliſle in the year 1537, and died at Horncaſtle in Lincolnſhire in 1556. He wrote, 1. *Epiſtola ad Gul. Hormanum*, in Latin verſe; printed in Horman's *Antiboſſican*, Lond. 1521, of which book Pitts erroneouſly makes Aldrich the author. 2. *Epigrammata varia*. 3. *Latin verſes, and another epiſtle to Horman*, prefixed to the *Vulgaria puerorum* of that author, Lond. 1519, 4to. 5. *Anſwers to certain queries concerning the abuſes of the maſs*; alſo *about receiving the ſacrament*.

Aldrich (Dr Henry), an eminent Engliſh divine and philoſopher, born at London in 1647, was educated at Weſtminſter ſchool under the famous Dr Buſby, and admitted of Chriſt-church college, Oxford. He

Aldrich.

He had a great ſhare in the controverſy with the Papiſts in the reign of James II. and biſhop Burnet ranks him among thoſe who examined all the points of popery with a ſolidity of judgment, clearneſs of argument, depth of learning, and vivacity of writing, far beyond any who had before that time written in our language. He rendered himſelf ſo conſpicuous, that at the Revolution, when Maſſey the popiſh dean of Chriſt-church fled, his deanery was conferred on him. In this ſtation he behaved in an exemplary manner, and that fabric owes much of its beauty to his ingenuity: it was Aldrich who deſigned the beautiful ſquare called *Peckwater-Quadrangle*, which is eſteemed an excellent piece of architecture. In imitation of his predeceſſor Dr Fell, he publiſhed, yearly, a piece of ſome ancient Greek author, as a preſent to the ſtudents of his houſe: he publiſhed *A Syſtem of Logic*, with ſome other pieces; and the reviſing Clarendon's Hiſtory of the Rebellion was intruſted to him and biſhop Spratt; but it doth not appear that they made any additions, or conſiderable alterations in it, as has been aſſerted by Mr Oldmixon. Beſides his preferments above mentioned, Dr Aldrich was alſo rector of Wem in Shropſhire. He was choſen prolocutor of the convocation in 1702. This worthy perſon died at Chriſt-church on the 14th of December 1710. As to his character, he was a moſt univerſal ſcholar, and had a taſte for all ſorts of learning, eſpecially architecture. Sir John Hawkins has favoured the public with ſeveral particulars relative to Dr Aldrich's ſkill in muſic; and on account of the Doctor's eminence in this reſpect, Sir John hath given his life, with his head prefixed. His abilities as a muſician rank him, we are told, among the greateſt maſters of the ſcience. He compoſed many ſervices for the church, which are well known; as are alſo his anthems, nearly to the number of twenty. He adapted, with great ſkill and judgment, Engliſh words to many of the notes of Paleſtrina, Cariſſimi, Victoria, and other Italian compoſers for the church, ſome of which are frequently ſung in the cathedrals as anthems. By the happy talent which Dr Aldrich poſſeſſed, of naturalizing the compoſitions of the old Italian maſters, and accommodating them to an Engliſh ear, he increaſed the ſtores of his own church. Though the Doctor chiefly applied himſelf to the cultivation of ſacred muſic, yet, being a man of humour, he could divert himſelf by producing pieces of a lighter kind. There are two catches of his; the one, "Hark the bonny Chriſt-church bells," the other intitled, "A Smoaking Catch," to be ſung by four men ſmoaking their pipes, which is not more difficult to ſing than diverting to hear. His love of ſmoaking was, it ſeems, ſo exceſſive as to be an entertaining topic of diſcourſe in the univerſity. Such was Dr Aldrich's regard for the advancement of muſic, and the honour of its profeſſors, that he had formed a deſign of writing a hiſtory of the ſcience; and the materials from which he propoſed to compile it are yet extant in the library of his own college. It appears from theſe materials, that he had marked down every thing which he had met with concerning muſic and muſicians; but that he had wrought no part of them into any kind of form.

Dr Aldrich is of ſome note as a Latin poet. In the *Muſæ Anglicanæ*, we find two elegant copies of verſes by him; one on the acceſſion of King William III. and the other on the death of the duke of Glouceſter. Sir John Hawkins hath preſerved a humorous tranſlation by him of the well-known Engliſh ballad,

Aldrich, Aldrovandus.

" A ſoldier and a ſailor,
" A tinker and a taylor," &c.

The following epigram, entitled "Cauſa Bibendi," is likewiſe aſcribed to Dr Aldrich:

" Si bene quid memini, Cauſæ ſunt quinque bibendi,
" *Hoſpitis Adventus; præſens Sitis*, atque *futura;*
" Aut *Vini Bonitas;* aut *quæ libet altera Cauſa.*"

The epigram has been thus tranſlated:

" If on my theme I rightly think,
" There are five reaſons why men drink:
" Good wine, a friend, becauſe I'm dry,
" Or leſt I ſhould be by and by,
" Or any other reaſon why."

The tranſlation is not equal to the original. It is evident, from the verſes cited and referred to, that Dr Aldrich was of a very cheerful and pleaſant turn of mind. Indeed, he is always ſpoken of as having been a man of wit; and as one who, to his great talents and virtues, joined thoſe amiable qualities, which rendered him the object of general affection, as well as of general eſteem and reſpect. Having never been married, he appropriated his income to works of hoſpitality and beneficence, and encouraging learning to the utmoſt of his power, of which he was a moſt munificent patron, as well as one of the greateſt men in England, if conſidered as a Chriſtian or a gentleman. He had always the intereſt of his college at heart, whereof he was an excellent governor. And as he was remarkable for modeſty and humility, concealing his name to thoſe ſeveral learned tracts he publiſhed, ſo at his death he appointed to be buried without any memorial in the cathedral; which his thrifty nephew complied with, depoſiting him on the ſouth ſide of biſhop Fell's grave, December 22, eight days after his deceaſe; which happened in the 63d or 64th year of his age.

ALDROVANDUS (Ulyſſes), profeſſor of philoſophy and phyſic at Bologna, the place of his nativity. He was a moſt curious inquirer into natural hiſtory, and travelled into the moſt diſtant countries on purpoſe to inform himſelf of their natural productions. Minerals, metals, plants and animals, were the objects of his curious reſearches; but he applied himſelf chiefly to birds, and was at great expence to have figures of them drawn from the life. Aubert le Mire ſays, that he gave a certain painter, famous in that art, a yearly ſalary of 200 crowns, for 30 years and upwards; and that he employed at his own expence Lorenzo Bennini and Cornelius Swintus, as well as the famous engraver Chriſtopher Coriolanus. Theſe expences ruined his fortune, and at length reduced him to the utmoſt neceſſity; and it is ſaid that he died blind in an hoſpital at Bologna, at a great age, in 1605. Mr Bayle obſerves, that antiquity does not furniſh us with any inſtance of a deſign ſo extenſive and ſo laborious as that of Aldrovandus, with regard to natural hiſtory; that Pliny has treated of more kinds of ſubjects, but only touches lightly on them, ſaying but a little upon any thing, whereas Aldrovandus has collected all he could meet with. His compilation, or that compiled upon his plan, conſiſts of 13 volumes in folio, ſeveral of which were printed after his death. He himſelf publiſhed his Ornithology, or Hiſtory of Birds, in three folio volumes, in 1599; and his ſeven books Of Inſects, which make another volume of the ſame ſize. The volume Of Serpents, three Of Quadrupeds, one Of Fiſhes, that Of exanguious Animals, the Hiſtory of Monſters, with the Supplement to that of Animals, the treatiſe Of Metals, and the Dendrology or Hiſtory of Trees, were publiſhed at ſeveral times after the death of Aldrovandus, by the care of ſeveral perſons; and Aldrovandus is the ſole author only of the firſt ſix volumes of this work, the reſt having been finiſhed and compiled by others, upon the plan of Aldrovandus; a moſt extenſive plan, wherein he not only relates what he has read in naturaliſts, but remarks alſo what hiſtorians have written, legiſlators ordained, and poets feigned; he explains alſo the different uſes which may be made of the things he treats of, in common life, in medicine, architecture, and other arts; in ſhort, he ſpeaks of morality, proverbs, devices, riddles, hieroglyphics, and many other things which relate to his ſubject.

ALDROVANDA, in botany, a genus of the pentandria order, belonging to the pentagynia claſs of plants; of which there is but one ſpecies. The calyx is divided into five parts; the petals are five; and the capſule has five valves, with ten ſeeds. It is a native of Italy and the Indies; and has no Engliſh name.

ALDUABIS (anc geog.), a river of Celtic Gaul, which riſing from Mount Jura, ſeparating the Sequani from the Helvetii, and running through the county of Burgundy, or the Franche Comté, environs almoſt on every ſide the city of Beaſnçon; and running by Dole, falls into the Saone near Chalone. In Cæſar it is called *Alduaſdubis*; in Ptolemy, *Dubis*: now *le Doux*.

ALE, a fermented liquor obtained from an infuſion of malt, and differing from beer chiefly in having a leſs proportion of hops. (See Brewing). This liquor, the natural ſubſtitute for wine in ſuch countries as could not produce the grape, was originally made in Egypt, the firſt planted kingdom, on the diſperſion from the eaſt, that was ſuppoſed unable to produce grapes. And, as the Noachian colonies pierced further into the weſt they found, or thought they found, the ſame defect, and ſupplied it in the ſame manner. Thus the natives of Spain, the inhabitants of France, and the aborigines of Britain, all uſed an infuſion of barley for their ordinary liquor: and it was called by the various names of *Cælia* and *Ceria* in the firſt country, *Cereviſia* in the ſecond, and *Curmi* in the laſt; all literally importing only *the ſtrong water*.

“ All the ſeveral nations (ſays Pliny) who inhabit the weſt of Europe, have a liquor with which they intoxicate themſelves, made of corn and water. The manner of making this liquor is ſomewhat different in Gaul, Spain, and other countries, and is called by many various names; but its nature and properties are every where the ſame. The people of Spain, in particular, brew this liquor ſo well, that it will keep good a long time. So exquiſite is the cunning of mankind, in gratifying their vicious appetites, that they have thus invented a method to make water itſelf intoxicate.” The method in which the ancient Britons, and other Celtic nations, made their ale, is thus deſcribed by Iſidorus and Oroſius. “ The grain is ſteeped in water and made to germinate, by which its ſpirits are excited and ſet at liberty; it is then dried and grinded; after which it is infuſed in a certain quantity of water; which being fermented, becomes a pleaſant, warming, ſtrengthening, and intoxicating liquor.” This ale was moſt commonly made of barley; but ſometimes of wheat, oats, and millet.

Anciently the Welch and Scots had alſo two kinds of ale, called *common ale* and *ſpiced ale*; and their value was thus aſcertained by law: “ If a farmer hath no mead, he ſhall pay two caſks of ſpiced ale, or four caſks of common ale, for one caſk of mead.” By this law, a caſk of ſpiced ale, nine palms in height, and 18 palms in diameter, was valued at a ſum of money equal in efficacy to L. 7. 10s. of our preſent money; and a caſk of common ale, of the ſame dimenſions, at a ſum equal to L. 3. 15s. This is a ſufficient proof, that even common ale in this period was an article of luxury among the Welch, which could only be obtained by the great and opulent. Wine ſeems to have been quite unknown even to the kings of Wales in this period, as it is not ſo much as once mentioned in their laws; though Giraldus Cambrenſis, who flouriſhed about a century after the conqueſt, acquaints us, that there was a vineyard in his time at Maenarper, near Pembroke, in South Wales.

Ale was the favourite liquor of the Anglo-Saxons and Danes, as it had been of their anceſtors the ancient Germans. Before their converſion to Chriſtianity, they believed that drinking large and frequent draughts of ale was one of the chief felicities which thoſe heroes enjoyed who were admitted into the hall of Odin.

There are various ſorts of ale known in Britain, particularly *pale* and *brown*: the former is brewed from malt ſlightly dried; and is eſteemed more viſcid than the latter, which is made from malt more highly dried or roaſted.

Pale ale brewed with hard waters, as thoſe of ſprings and wells, is judged the moſt wholeſome, in regard the mineral particles tend to prevent the coheſions of thoſe drawn from the grain, and enable them to paſs the proper ſecretions the better; ſofter waters, as thoſe of rivers, and rain, ſeem better ſuited to draw out the ſubſtance of high-dried malts, which retain many igneous particles, beſt abſorbed in a ſmooth vehicle.

In Staffordſhire, they have a ſecret of fining ale in a very ſhort time. Plot conjectures it to be done by adding alum, or vinegar, in the working.

Ale is prepared various ways, and of various ingredients, as of wheat, rye, millet, oats, barley, the berries of the quick-bean, &c.

Some have found that the juice which bleeds from the birch or ſycamore is of great uſe on this occaſion, applied inſtead of water. It makes one buſhel of malt go as far as four in the common way.

Some have a method of preparing ale, ſo that it will keep, carried to the Eaſt or Weſt Indies. The ſecret is, by maſhing twice with freſh malt; boiling twice; and, after ſhipping it, putting to every five gallons two new-laid eggs whole, to remain therein. It is ſaid, that, in a fortnight's time, the ſhells will be diſſolved; and the eggs become like wind-eggs; and that afterwards the white will diſappear and the yolk remain untouched.

Ale is generally held to be more diuretic than beer, in regard it is ſmoother, more ſoftening, and relaxing; ſo that when urine is to be promoted by facilitating the paſſage, ale is moſt likely to effect it.

Ale is flatulent; and hence ſometimes produces colics, and the cholera morbus: it is aceſcent: but it does not produce calcareous diſeaſes, as has been aſſerted.

If malt-liquor, of any degree of ſtrength, is become flat and tartiſh, as it is uſed, it ſhould be drawn out of the caſk into a jug, in which as many drams of powdered chalk is put as there are to be pints of liquor; thus a new ferment will be raiſed, a ſprightly taſte will be reſtored to the liquor, and its acidity will be deſtroyed. Tart liquors of this kind are apt to produce a dyſury, ſtrangury, or a gonorrhœa; in which caſes, a ſmall quantity of brandy may be taken.

The conſumption of ale in Great Britain is incredible. It was computed twenty years ago at the value of four millions yearly, including Great Britain and Ireland.

The duties on ale and beer make a principal branch of the revenue in Britain. They were firſt impoſed by the 12th of Car. II. and have been continued by ſeveral ſubſequent acts of parliament to firſt Geo. III. which lays an additional duty of 3d. per barrel. In the whole, the brewer of ale and beer for ſale ſhall pay 8s. for every barrel of either, above 6s. a barrel; and for every barrel of 6s. or under, the ſum of 1s. 4d.

Medicated ALES, thoſe wherein medicinal herbs have been infuſed, or added during the fermentation. See PHARMACY, (Index).

Gill ALE, is that in which the dried leaves of gill or ground-ivy have been infuſed. It is eſteemed abſterſive and vulnerary, and conſequently good in diſorders of the breaſt and obſtructions of the viſcera.

ALE-Conner, an officer in London, who inſpects the meaſures uſed in public-houſes. There are four aleconners, who are all choſen by the liverymen in common-hall on Midſummer-day.

ALE-Houſes muſt be licenſed by juſtices of the peace, who take recognizances of the perſons licenſed, and of their ſureties, viz. 10l. each, that they will not ſuffer unlawful gaming, nor other diſorderly practices in their houſes. Every perſon, excepting thoſe who ſell ale in fairs, neglecting to procure a licenſe, is liable to a penalty of 40s. for the firſt offence, 4l. for the ſecond, and 6l. for the third, with all coſts. The licence is granted on the firſt of September, or within twenty days after, at a general meeting of the juſtices for the diviſion to which he belongs, upon his producing a certificate to his character, unleſs, by living in a city or town-corporate, this laſt circumſtance is diſpenſed with, and continues in force for one year only. Alehouſe keepers, ſelling ale in ſhort meaſure, are liable to a penalty not exceeding 40s. and not leſs than 10s. and likewiſe to a fine of 10s. for permitting tipling, &c.

By 29th Geo. II. c. 12. perſons keeping ale-houſes in Scotland ſhall be licenſed as in England, and the juſtices there ſhall meet annually to licenſe ale-houſes; on each of which licenſes a fee of 1 s. is payable to the clerk of the peace. Magiſtrates of royal boroughs ſhall meet yearly for the like purpoſe; but where there ſhall not be a ſufficient number of magiſtrates to act in any royal borough, juſtices may grant licenſes, to be in force for one year only. Ibid.

Perſons in Scotland convicted of keeping unlicenſed ale-houſes ſhall forfeit for the firſt offence 5s. for the ſecond 10s. for the third 20s. and to be diſqualified; and for every ſubſequent offence 40s. to be levied by diſtreſs and ſale, one moiety to the informer, the other to the poor of the pariſh. Conviction to be intimated to the offender, and certified to the clerk of the peace, and recorded: but perſons aggrieved may appeal to the quarter ſeſſions. Ibid.

Licenſes for houſes on the military roads in Scotland ſhall be iſſued on payment of 1 s. only to the clerk of the peace: making out licenſes before the ſame be ſtamped, is a penalty of 10l. and making them contrary to the intention of this act, 5l. and the ſame ſhall be vacated, unleſs the duty and fine be paid, and the receipt produced, and licenſe ſtamped. Ibid.

ALE-Silver, a tax paid annually to the lord-mayor of London, by all who ſell ale within the city.

ALEA, in Roman antiquity, denotes in general all manner of games of chance; but, in a more reſtricted ſenſe, was uſed for a particular game played with dice and tables, not unlike our backgammon.

ALEANDER (Jerome), cardinal and archbiſhop of Brindiſi, was born in 1480; and diſtinguiſhed himſelf at the beginning of the reformation, by the oppoſition he made to Luther: for being ſent into Germany as the pope's nuncio in 1519, he acted, as occaſion ſerved, in the character both of ambaſſador and doctor; and declaimed three hours together againſt Luther's doctrine before the diet of Worms, but could not prevent that celebrated reformer from being heard in that diet. He publiſhed ſeveral works, and died at Rome in 1542.

ALEANDER (Jerome), a learned man of the ſeventeenth century, born in the principality of Friuli, of the ſame family with the preceding. When he went to Rome, he was employed as ſecretary under cardinal Octavius Bandini, and diſcharged this office with great honour for almoſt twenty years. He afterwards, by the perſuaſion of Urban VIII. who had a great eſteem for him, became ſecretary to Cardinal Barberini, whom he accompanied to Rome when he went there in the character of legate *à latere*, and in whoſe ſervice he died in 1631. He was one of the firſt members of the academy of Humoriſts, wrote a learned treatiſe in Italian on the device of the ſociety, and diſplayed his genius on many different ſubjects. Barberini gave him a magnificent funeral at the academy of Humoriſts; the academiſts carried his corpſe to the grave; and Gaſpar Simeonibus, one of the members, made his funeral oration.

ALECTO, one of the FURIES, daughter of Acheron and Night, or, as others would have it, of Pluto and Proſerpine.

ALECTORIA, a ſtone ſaid to be formed in the gall-bladders of old cocks, to which the ancients aſcribed many fabulous virtues. This is otherwiſe called *Alectorius Lapis*, ſometimes *Alectorolithos*, in Engliſh the *cock-ſtone*. The more modern naturaliſts hold the *alectorius lapis* to be originally ſwallowed down, not generated in, the ſtomach or gizzard of cocks and capons. It is known that many of the fowl-kind make a practice of ſwallowing pebbles, as it is ſuppoſed to be of ſervice in the buſineſs of trituration and digeſtion.

ALECTOROMANTIA, in antiquity, a ſpecies of divination performed by means of a cock. This is otherwiſe called *Alectryomancy*; of which there appear to have been different ſpecies. But that moſt ſpoken of by authors was in the following manner: A circle being deſcribed on the ground, and divided into twenty-four equal portions, in each of theſe ſpaces was written one of the letters of the alphabet, and on each of the letters was laid a grain of wheat; after which, a cock being turned looſe in the circle, particular notice was taken of the grains picked up by the cock, becauſe the letters under them, being formed into a word, made the anſwer deſired. It was thus, according to Zonaras, that Libanius and Jamblicus ſought who ſhould ſuceeed the emperor Valens; and the cock eating the grains anſwering to the ſpaces ΘΕΟΛ, ſeveral whoſe names began with thoſe letters, as Theodotus, Theodiſtus, Theodulus, &c. were put to death; which did not hinder, but promote, Theodoſius to the ſucceſſion. But the ſtory, however current, is but ill ſupported: It has been called in queſtion by ſome, and refuted by others, from the ſilence of Marcellinus, Socrates, and other hiſtorians of that time.

A-LEE, in the ſea-language, a term only uſed when the wind, croſſing or flanking the line of a ſhip's courſe, preſſes upon the maſts and ſails ſo as to make her incline to one ſide, which is called the lee-ſide: hence, when the helm is moved over to this ſide, it is ſaid to be *a-lee* or *hard-a-lee*.

ALEGAMBE (Philip), a celebrated Jeſuit, born at Bruſſels in 1592, diſtinguiſhed himſelf by publiſhing a Bibliotheque of the writers of his order, and died at Rome in 1652.

ALEGRETTE, a ſmall town of Portugal, in Alentejo, on the confines of Port Alegre, on the river Cajah, which falls into the Guadiana, a little below Badajoz, near the frontiers of Spaniſh Eſtremadura. It is a very pretty town, and finely ſituated; ſeven miles ſouth-eaſt of Port Alegre, and thirty north of Elvas. W. Long. 5. 20. N. Lat. 39. 6.

ALEIUS CAMPUS (anc. geog.), a plain in Cilicia, on this ſide the river Pyramus, near the mountain Chimera, famous for Bellerophon's wandering and periſhing there, after being thrown off Pegaſus; which is the reaſon of the appellation.

ALEMANIA, or ALLEMANIA, (anc. geog.) a name of Germany, but not known before the time of the Antonines, and then uſed only for a part. After the Marcomanni and their allies had removed from the Rhine, a rabble, or collection of people from all parts of Gaul, as the term *Alemanni* denotes, prompted either by levity or poverty, occupied the Agri, called *Decumates* by Tacitus, becauſe they held them on a tithe; now ſuppoſed to be the duchy of *Wirtemburg*. Such appear to be the ſmall beginnings of Alemania, which was in after-times greatly enlarged: but ſtill it was conſidered as a diſtinct part; for Caracalla, who conquered the Alemanni, aſſumed the ſurname both of *Alemannicus* and *Germanicus*.

ALEMBDAR, an officer in the court of the Grand Signior, who bears the green ſtandard of Mahomet, when the ſultan appears in public on any ſolemn occaſion.

ALEMBERT (John le Rond d'), an eminent French philoſopher, was born at Paris in 1717. He derived the name of John le Rond from that of the church near which, after his birth, he was expoſed as a foundling. His father, informed of this circumſtance, liſtened to the voice of nature and duty, took meaſures for the proper education of his child, and for his future ſubſiſtence in a ſtate of eaſe and independence.

He received his firſt education in the College of the Four Nations, among the Janſeniſts, where he gave early marks of capacity and genius. In the firſt year of his philoſophical ſtudies, he compoſed a Commentary on the Epiſtle of St Paul to the Romans. The Janſeniſts conſidered this production as an omen that portended to the party of Port-Royal a reſtoration to ſome part of their ancient ſplendor, and hoped to find one day in M. d'Alembert a ſecond Paſcal. To render this reſemblance more complete, they engaged their riſing pupil in the ſtudy of the mathematics; but they ſoon perceived that his growing attachment to this ſcience was likely to diſappoint the hopes they had formed with reſpect to his future deſtination: they, therefore, endeavoured to divert him from this line: but their endeavours were fruitleſs.

At his leaving college, he found himſelf alone and unconnected in the world; and ſought an aſylum in the houſe of his *nurſe*. He comforted himſelf with the hope, that his fortune, though not ample, would better the condition and ſubſiſtence of that family, which was the only one that he could conſider as his own: Here, therefore, he took up his reſidence, reſolving to apply himſelf entirely to the ſtudy of geometry: And here he lived, during the ſpace of forty years, with the greateſt ſimplicity, diſcovering the augmentation of his means only by increaſing diſplays of his beneficence, concealing his growing reputation and celebrity from theſe honeſt people, and making their plain and uncouth manners the ſubject of good-natured pleaſantry and philoſophical obſervation. His good nurſe perceived his ardent activity; heard him mentioned as the writer of many books; but never took it into her head that he was a great man, and rather beheld him with a kind of compaſſion. "*You will never*," ſaid ſhe to him one day, "*be any thing but a philoſopher—and what is a philoſopher?—a fool, who toils and plagues himſelf during his life, that people may talk of him when* HE IS NO MORE."

As M. d'Alembert's fortune did not far exceed the demands of neceſſity, his friends adviſed him to think of a profeſſion that might enable him to augment it. He accordingly turned his views to the law, and took his degrees in that line; but ſoon abandoned this plan, and applied to the ſtudy of medicine. Geometry, however, was always drawing him back to his former purſuits, and after many ineffectual efforts to reſiſt its attractions, he renounced all views of a lucrative profeſſion, and gave himſelf over entirely to mathematics and poverty.

In the year 1741 he was admitted member of the Academy of Sciences; for which diſtinguiſhed literary promotion, at ſuch an early age, he had prepared the way by correcting the errors of a celebrated work*, which was deemed *claſſical* in France in the line of geometry. He afterwards ſet himſelf to examine, with deep attention and aſſiduity, what muſt be the motion of a body which paſſes from one fluid into another more denſe, in a direction not perpendicular to the ſurface ſeparating the two fluids. Every one knows the phenomenon which happens in this caſe, and which

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* The *Analyſe demontrée* of F. Beinau.

amuſes children under the denominations of *Ducks* and *Drakes*; but M. d'Alembert was the firſt who explained it in a ſatisfactory and philoſophical manner.

Two years after his election to a place in the academy, he publiſhed his *Treatiſe on Dynamics*. The new principle developed in this treatiſe conſiſted in eſtabliſhing equality, at each inſtant, between the changes that the motion of a body has undergone, and the forces or powers which have been employed to produce them; or, to expreſs the thing otherwiſe, in ſeparating into *two parts* the action of the moving powers, and conſidering the *one* as producing alone the motion of the body, in the ſecond inſtant, and the *other* as employed to deſtroy that which it had in the firſt.

So early as the year 1744, M. d'Alembert had applied this principle to the theory of the equilibrium, and the motion of fluids; and all the problems before ſolved by geometricians became, in ſome meaſure, its corollaries. The diſcovery of this new principle was followed by that of a new calculus, the firſt trials of which were publiſhed in a *Diſcourſe on the general Theory of the Winds*, to which the prize-medal was adjudged by the academy of Berlin in the year 1746, and which was a new and brilliant addition to the fame of M. d'Alembert. This new calculus of partial differences he applied, the year following, to the problem of vibrating chords, whoſe ſolution, as well as the theory of the oſcillations of the air and the propagation of ſound, had been given but incompletely by the geometricians who preceded him, and theſe were his maſters or his rivals.

In the year 1749 he furniſhed a method of applying his principle to the motion of any body of a given figure; and he ſolved the problem of the preceſſion of the equinoxes, determined its *quantity*, and explained the phenomenon of the nutation of the terreſtrial axis diſcovered by Dr Bradley.

In 1752, M. d'Alembert publiſhed a treatiſe on the *Reſiſtance of Fluids*, to which he gave the modeſt title of an *Eſſay*; but which contains a multitude of original ideas and new obſervations. About the ſame time he publiſhed, in the Memoirs of the Academy of Berlin, *Reſearches concerning the Integral Calculus*, which is greatly indebted to him for the rapid progreſs it has made in the preſent century.

While the ſtudies of M. d'Alembert were confined to geometry, he was little known or celebrated in his native country. His connections were limited to a ſmall ſociety of ſelect friends: he had never ſeen any man in high office except M. d'Argenſon. Satisfied with an income which furniſhed him with the neceſſaries of life, he did not aſpire after opulence or honours, nor had they been beſtowed upon him, as it is eaſier to confer them on thoſe who ſolicit them, than to look out for men who deſerve them. His cheerful converſation, his ſmart and lively ſallies, a happy knack at telling a ſtory, a ſingular mixture of malice of ſpeech with goodneſs of heart, and of delicacy of wit with ſimplicity of manners, rendered him a pleaſing and intereſting companion, and his company conſequently was much ſought after in the faſhionable circles. His reputation, at length, made its way to the throne, and rendered him the object of royal attention and beneficence. He received alſo a penſion from government, which he owed to the friendſhip of Count d'Argenſon.

The tranquillity of M. d'Alembert was abated when his fame grew more extenſive, and when it was known beyond the circle of his friends, that a fine and enlightened taſte for literature and philoſophy accompanied his mathematical genius. Our author's eulogiſt aſcribes to envy, detraction, and to other motives nearly as ungenerous, all the diſapprobation, oppoſition, and cenſure that M. d'Alembert met with on account of the publication of the famous Encyclopedical Dictionary of Arts and Sciences, in conjunction with Diderot. None ſurely will refuſe the well-deſerved tribute of applauſe to the eminent diſplays of genius, judgment, and true literary taſte, with which M. d'Alembert has enriched the great work now mentioned. Among others, the Preliminary Diſcourſe he has affixed to it, concerning the riſe, progreſs, connections, and affinities of all the branches of human knowledge, is perhaps one of the moſt capital productions of which the philoſophy of the preſent age can boaſt. Nor will it be diſputed, that the maſter-builders of this new and ſtupendous *temple* of ſcience, for the worſhip of NATURE, had alſo really in view the advancement of human knowledge, and the improvement of the arts and ſciences. This, no *true*, no candid philoſopher, will call in queſtion. But that in the *inner court* of this temple there was a confederacy formed againſt all thoſe who looked higher than *nature*, for the principal object of their veneration and confidence, is a fact too palpable, nay too boldly avowed, to ſtand in need of any proof.

Monthly Review for Mar. 1787.

Some time after this, d'Alembert publiſhed his Philoſophical, Hiſtorical, and Philological Miſcellanies. Theſe were followed by the Memoirs of Chriſtina Queen of Sweden; in which M. d'Alembert ſhowed that he was acquainted with the natural rights of mankind, and was bold enough to aſſert them. His *Eſſay on the Intercourſe of Men of Letters with Perſons high in Rank and Office*, wounded the former to the quick, as it expoſed to the eyes of the public the ignominy of thoſe ſervile chains, which they feared to ſhake off, or were proud to wear. A lady of the court hearing one day the author accuſed of having exaggerated the deſpotiſm of the great, and the ſubmiſſion they require, anſwered ſlily, *If he had conſulted me, I would have told him ſtill more of the matter.*

M. d'Alembert gave very elegant ſpecimens of his literary abilities in his tranſlations of ſome ſelect pieces of Tacitus. But theſe occupations did not divert him from his mathematical ſtudies; for about the ſame time he enriched the Encyclopédie with a multitude of excellent articles in that line, and compoſed his *Reſearches on ſeveral important Points of the Syſtem of the World*, in which he carried to a higher degree of perfection the ſolution of the problem of the perturbations of the planets, that had ſeveral years before been preſented to the Academy.

In 1759 he publiſhed his *Elements of Philoſophy*: a work extolled as remarkable for its preciſion and perſpicuity; in which, however, are ſome tenets relative both to metaphyſics and moral ſcience, that are far from being admiſſible.

The reſentment that was kindled (and the diſputes that followed it) by the article *Geneva*, inſerted in the

Encyclopédie, are well known. M. d'Alembert did not leave this field of controverſy with flying colours. Voltaire was an auxiliary in the conteſt ; but as, in point of candour and decency, he had no reputation to loſe ; and as he weakened the blows of his enemies, by throwing both them and the ſpectators into fits of laughter, the iſſue of the war gave him little uneaſineſs. It fell more heavily on d'Alembert ; and expoſed him, even at home, to much contradiction and oppoſition.

It was on this occaſion that the late king of Pruſſia offered him an honourable aſylum at his court, and the place of preſident of his academy ; and was not offended at his refuſal of theſe diſtinctions, but cultivated an intimate friendſhip with him during the reſt of his life. He had refuſed, ſome time before this, a propoſal made by the empreſs of Ruſſia to intruſt him with the education of the Grand Duke ;—a propoſal accompanied with all the flattering offers that could tempt a man, ambitious of titles, or deſirous of making an ample fortune : but the objects of his ambition were tranquillity and ſtudy.

In the year 1765, he publiſhed his *Diſſertation on the Deſtruction of the Jeſuits*. This piece drew upon him a ſwarm of adverſaries, who confirmed the merit and credit of his work by their manner of attacking it.

Beſide the works already mentioned, he publiſhed nine volumes of memoirs and treatiſes, under the title of *Opuſcules ;* in which he has ſolved a multitude of problems relative to aſtronomy, mathematics, and natural philoſophy ; of which our panegyriſt gives a particular account, more eſpecially of thoſe which exhibit new ſubjects, or new methods of inveſtigation.

He publiſhed alſo *Elements of Muſic ;* and rendered, at length, the ſyſtem of Rameau intelligible ; but he did not think the mathematical theory of the ſonorous body ſufficient to account for the rules of that art.—He was always fond of muſic ; which, on the one hand, is connected with the moſt ſubtle and learned reſearches of rational mechanics ; while, on the other, its power over the ſenſes and the ſoul exhibits to philoſophers phenomena no leſs ſingular, and ſtill more inexplicable.

In the year 1772, he was choſen ſecretary to the French academy. He formed, ſoon after this preferment, the deſign of writing the lives of all the deceaſed academicians, from 1700 to 1772 ; and in the ſpace of three years he executed this deſign, by compoſing 70 eulogies.

M. d'Alembert died on the 29th of October 1783. There were many amiable lines of candour, modeſty, diſintereſtedneſs, and beneficence, in his moral character ; which are deſcribed, with a diffuſive detail, in his eulogium, by M. Condorcet, *Hiſt. de l'Acad. Royale des Sciences*, 1783.

ALEMBIC, a chemical veſſel, uſually made of glaſs or copper, formerly uſed for diſtillation. The bottom part, which contained the ſubject for diſtillation, is called, from its ſhape, the *cucurbit ;* the upper part, which receives and condenſes the ſteam, is called the *head*, the beak of which is fitted into the neck of a receiver. Retorts, and the common *worm-ſtill*, are now more generally employed.

ALEMBROTH, in the writings of the alchemiſts, a word uſed for a ſort of fixed alkaline ſalt, which had the power of the famous alkaheſt, in diſſolving bodies, opening the pores of moſt or all known ſubſtances, and thence, as well as by deſtroying ſulphurs, promoting the ſeparation of metals from their ores.—It is alſo uſed for a compound of corroſive mercury and ſal ammoniac. See CHEMISTRY.

ALENIO (Julius), a Jeſuit, born at Breſcia in the republic of Venice. He travelled into the eaſtern countries ; and arrived at Macao in 1610, where he taught mathematics. From thence he went to the empire of China, where he continued to propagate the Chriſtian religion for thirty-ſix years. He was the firſt who planted the faith in the province of Xanſi, and he built ſeveral churches in the province of Fokien. He died in Auguſt 1649, leaving behind him ſeveral works in the Chineſe language.

ALENTEJO, a province of Portugal, between the rivers of Tajo and Guadiana : the ſoil is very fertile, and the inhabitants laborious and induſtrious. The principal town is Ebora.

ALENZON, a large handſome town of France, in lower Normandy, with the title of a dutchy. It is ſurrounded with good walls, and flanked with towers. The caſtle was formerly a place of great conſequence, and has held out long ſieges. It has but one pariſh-church, which has a bold and noble front. Among the nunneries, that of St Clair is moſt remarkable. It is ſeated on the river Sarte, in a vaſt open plain, which produces all ſorts of corn and fruit. Near it there are quarries of ſtone fit for building, wherein are found a ſort like Briſtol ſtones. The linen made at Alenzon is very good, and ſells at Paris. It is 20 miles north of Mans, 63 ſouth-by weſt of Rouen, and 88 ſouth-weſt of Paris. W. Long. 0. 10. N. Lat. 48. 25.

ALEPPO, or HALAB, the capital of the Pachalic, and of all Syria, and the ordinary reſidence of the pacha, is ſituated in the vaſt plain which extends from the Orontes to the Euphrates, and which towards the ſouth terminates in the deſart. It is built on eight hills or eminences, on the higheſt of which the caſtle is erected, and is ſuppoſed to be the ancient Beræa. This mount is of a conic form, and ſeems in a great meaſure to be raiſed with the earth thrown up out of a deep broad ditch which ſurrounds it. The ſuburbs to the north-north-eaſt are next in height to this, and thoſe to the weſt-ſouth-weſt are much lower than the parts adjacent, and than any other part of the city. The houſes are large and commodious, having terraces on their tops, and generally ſky-lights in form of a dome to let the light into the rooms, which from their loftineſs, the gilding on the window-ſhutters, cupboard-doors, &c. have at firſt entrance a very grand and agreeable effect. They are all ſo equal in height, that there are ſeldom any ſteps to aſcend or deſcend in going from one houſe to another ; while ſeveral large vaulted ſtreets increaſe the facility of communication, by affording a paſſage to every part of the city, free from the embarraſſment of the open ſtreets. They are carefully paved ; have gutters and a foot-pavement on each ſide ; and the middle of the ſtreet is laid with brick, the ſmall end upwards, for the convenience of the horſes. There is alſo a cleanlineſs obſerved here unknown to the other cities of Turkey, and which is not attended with the trouble of ſcavengers, there being aſs-drivers who go about the city and take up the rubbiſh and duſt, which each inhabitant is obliged to ſweep together; and though the heat of the climate renders this labour more eaſy, the ſame heat obliges them to greater cleanlineſs in order to preſerve the ſalubrity of the air.

The moſques in Aleppo are numerous, and ſome few of them magnificent. Before each of them is an area, with a fountain in the middle, deſigned for ablutions before prayers; and behind ſome of the larger there are little gardens. There are many large khans, or caravanſeras, conſiſting of a capacious ſquare, on all ſides of which are a number of rooms, built on a ground-floor, uſed occaſionally for chambers, ware-houſes, or ſtables. Above ſtairs there is a colonade or gallery on every ſide, in which are the doors of a number of ſmall rooms, wherein the merchants, as well ſtrangers as natives, tranſact moſt of their buſineſs.

The bazars or market-places are long covered narrow ſtreets, on each ſide of which are a great number of ſmall ſhops, juſt ſufficient to hold the tradeſman and his goods, the buyer being obliged to ſtand without. Each ſeparate branch of buſineſs has a particular bazar, which is locked up, as well as the ſtreets, an hour and a half after ſun-ſet: but the locks are of wood, though the doors are caſed with iron. The ſlaughter-houſes are in the ſuburbs, upon the open fields. The tanners have a khan to work in near the river. To the ſouthward in the ſuburbs they burn lime; and a little beyond that there is a village where they make ropes and catgut. On the oppoſite ſide of the river, to the weſtward, there is a glaſs-houſe, where they make a coarſe white glaſs, in the winter only; for the greateſt part of this manufacture is brought from a village 35 miles weſtward.

The ſituation of Aleppo, beſides the advantage of a rich and fruitful ſoil, poſſeſſes alſo that of a ſtream of freſh water, which never becomes dry. This rivulet, which is about as large as that of the Gobelins at Paris, or the New River near London, riſes in the mountains of Aentab, and terminates ſix leagues below Aleppo, in a moraſs full of wild boars and pelicans. Near Aleppo, its banks, inſtead of the naked rocks which line them in the upper part of its courſe, are covered with a fertile earth, and laid out in gardens, or rather orchards, which, in a hot country, and eſpecially in Turkey, cannot but be delightful. The city is itſelf one of the moſt agreeable in Syria, and is perhaps the cleaneſt and beſt built of any in Turkey. On whatever ſide it is approached, its numerous minarets and domes preſent an agreeable proſpect to the eye, fatigued with the continual ſameneſs of the brown and parched plains. In the centre is an artificial mountain ſurrounded by a dry ditch, on which is a ruinous fortreſs. From hence we have a fine proſpect of the whole city, and to the north diſcover the ſnowy tops of the mountains of Bailan; and on the weſt, thoſe which ſeparate the Orontes from the ſea; while to the ſouth and eaſt, the eye can diſcern as far as the Euphrates. It the time of Omar, this caſtle ſtopped the progreſs of the Arabs for ſeveral months, and was at laſt taken by treachery, but at preſent would not be able to reſiſt the feebleſt aſſault. Its ſlight wall, low, and without a buttreſs, is in ruins; its little old towers are in no better condition; and it has not four cannon fit for ſervice, not excepting a culverine nine feet long, taken from the Perſians at the ſiege of Baſſora. Three hundred and fifty Janiſaries, who ſhould form the garriſon, are buſy in their ſhops, and the aga ſcarcely finds room in it to lodge his retinue. It is remarkable that this aga is named immediately by the Porte, which, ever ſuſpicious, divides as much as poſſible the different offices. Within the walls of the caſtle is a well, which, by means of a ſubterraneous communication, derives its waters from a ſpring a league and a quarter diſtant. In the environs of the city, we find a number of large ſquare ſtones, on the top of which is a turban of ſtone, which are ſo many tombs. There are many riſing grounds round it, which, in caſe of a ſiege, would greatly facilitate the approaches of the aſſailants. Such, among others, is that on which the houſe of the Derviches ſtands, and which commands the canal and the rivulet: Aleppo, therefore, cannot be eſteemed a place of importance in war, though it be the key of Syria to the north; but, conſidered as a commercial city, it has a different appearance. It is the emporium of Armenia and the Diarbekar; ſends caravans to Bagdad and into Perſia; and communicates with the Perſian gulph and India, by Baſſora, with Egypt and Mecca by Damaſcus, and with Europe by Scandaroon (Alexandretta) and Latakia. Commerce is there principally carried on by barter. The chief commodities are raw or ſpun cottons, clumſy linens fabricated in the villages; ſilk ſtuffs manufactured in the city, copper, *bourres* (coarſe cloths) like thoſe of Rouen, goats hair brought from Natolia; the gall nuts of the Kourdeſtan, the merchandiſe of India, ſuch as ſhawls and muſlins, and piſtachio nuts of the growth of the neighbourhood. The articles ſupplied by Europe are the Languedoc cloths, cochineal, indigo, ſugar, and ſome other groceries. The coffee of America, though prohibited, is introduced, and ſerves to mix with that of Moka. The French have at Aleppo a conſul and ſeven counting-houſes; the Engliſh and the Venetians two, and the merchants of Leghorn and Holland one. The emperor appointed a conſul there in 1784, in the perſon of a rich Jew merchant, who ſhaved his beard to aſſume the uniform and the ſword. Ruſſia has alſo ſent one very lately. Aleppo is not exceeded in extent by any city in Turkey, except Conſtantinople and Cairo, and perhaps Smyrna. The number of inhabitants has been computed at 200,000; but in theſe calculations certainty is impoſſible. However, if we obſerve that this city is not larger than Nantes or Marſeilles, and that the houſes conſiſt only of one ſtory, we ſhall perhaps not think it probable they exceed 100,000. The people of this city, both Turks and Chriſtians, are with reaſon eſteemed the moſt civilized in all Turkey; and the European merchants no where enjoy ſo much liberty, or are treated with ſo much reſpect.

The air of Aleppo is very dry and piercing, but at the ſame time very ſalubrious for all who are not troubled with aſthmatic complaints. The city, however, and the environs, are ſubject to a ſingular endemial diſorder, which is called the ringworm or pimple of Aleppo; it is in fact a pimple which is at firſt inflammatory, and at length becomes an ulcer of the ſize of the nail. The uſual duration of this ulcer is one year;

it commonly fixes on the face, and leaves a ſcar which disfigures almoſt all the inhabitants. It is alleged that every ſtranger who reſides there three months is attacked with it: experience has taught that the beſt mode of treatment is to make uſe of no remedy. No reaſon is aſſigned for this malady: but M. Volney ſuſpects it proceeds from the quality of the water, as it is likewiſe frequent in the neighbouring villages, in ſome parts of the Diarbekar, and even in certain diſtricts near Damaſcus, where the ſoil and the water have the ſame appearances. Of the Chriſtian inhabitants the greater number are Greeks, next to them the Armenians, then the Syrians, and laſtly the Maronites; each of whom have a church in the city called *Judida;* in which quarter, and the parts adjacent, moſt of them reſide. The common language is the vulgar Arabic, but the Turks of condition uſe the Turkiſh. Moſt of the Armenians can ſpeak the Armenian, ſome few Syrians underſtand Syriac, and many of the Jews Hebrew; but ſcarce one of the Greeks underſtand a word of Greek. The people in general are of a middle ſtature, and tolerably well proportioned; but they ſeem neither vigorous nor active. Both ſexes are handſome when young; but the beard ſoon disfigures the men: and the women, as they come early to maturity, alſo fade very ſoon; females are generally married from 14 to 18 years of age, and many under 14. The people of rank here are polite and affable, making allowances for that ſuperiority which the Mahometan religion inſtructs its votaries to aſſume over all who hold a different faith. Their bread is generally of wheat flour made into thin cakes, but very ill prepared, and is generally eaten as ſoon as it comes out of the oven. The principal people have ſome loaves of a finer flour, which are well fermented and baked. Beſides theſe, there are a variety of biſcuits, moſt of which are ſtrewed on the top with ſome kind of ſeeds. The Europeans have very good bread, baked and prepared in the French manner. All the inhabitants of both ſexes ſmoke tobacco to great exceſs; even the very ſervants have almoſt conſtantly a pipe in their mouths. Coaches or carriages are not uſed here; therefore perſons of quality ride on horſeback in the city, with a number of ſervants walking before them, according to their rank: ladies of the firſt diſtinction are even compelled to walk on foot in the city, or to any place at a moderate diſtance; in longer journies they are carried by mules, in a kind of couch cloſe covered up. There are a number of public bagnios in this city, which are uſed by people of all ranks, except thoſe of the higheſt diſtinction, who commonly have baths and every other convenience in their own houſes. Aleppo is 70 miles eaſt of Scandaroon, on the ſea-coaſt, and 175 north-by-eaſt of Damaſcus. E. long. 37. 40. N. lat. 36. 12.

Aleppo (the Pachalic of), one of the five governments into which Syria is divided. It comprehends the country extending from the Euphrates to the Mediterranean, between two lines, one drawn from Scandaroon to Beer, along the mountains; the other from Beles to the ſea, by Mara and the bridge of Shoger. This ſpace principally conſiſts of two plains; that of Antioch to the weſt, and that of Aleppo to the eaſt: the north and the ſea coaſt are occupied by conſiderably high mountains, known to the ancients by the names of Amanus and of Rhoſus. In general, the ſoil of this government is fat and loamy. The lofty and vigorous plants which ſhoot up every where after the winter rains prove its fertility, but its actual fruitfulneſs is but little. The greateſt part of the lands lie waſte; ſcarcely can we trace any marks of cultivation in the environs of the towns and villages. Its principal produce conſiſts in wheat, barley, and cotton, which are found eſpecially in the flat country. In the mountains, they rather chooſe to cultivate the vine, mulberry, olive, and fig trees. The ſides of the hills towards the ſea-coaſts are appropriated to tobacco, and the territory of Aleppo to piſtachios. The paſturage is not to be reckoned, becauſe that is abandoned to the wandering hordes of the Turkmen and Curds.

In the greater part of the pachalics the pacha is, as his title imports, at once the viceroy and farmer-general of the country; but in that of Aleppo he does not poſſeſs the latter office. This the port has beſtowed on a *mehaſſel* or collector, who is immediately accountable for what he receives. His leaſe is only for a year. The preſent rent of his farm is 800 purſes (above £. 40,000); but to this muſt be added the price of the *babouchet* (Turkiſh ſlippers), or a preſent of three or four thouſand pounds, to purchaſe the favour of the viſir and men in office. For theſe two ſums the farmer receives all the duties of the government; which are, firſt, The produce of import and export duties on merchandiſe coming from Europe, India, and Conſtantinople, and on that exported in exchange. Secondly, The taxes paid by the herds of cattle brought every year by the Turkmen and Curds from Armenia and the Diarbekar, to be ſold in Syria. Thirdly, The fifth of the ſalt-works of Djeboul. And laſtly, The miri, or land tax. Theſe united may produce about £. 60,000.

The pacha, deprived of this lucrative branch of the adminiſtration, receives a fixed allowance of about £. 8300. This revenue has always been inadequate to the expences; for, beſides the troops he is obliged to maintain, and the reparation of the highways and fortreſſes, the expences of which he is obliged to defray, he is under the neceſſity of making large preſents to the miniſters, in order to keep his place; but the Porte adds to the account the contributions he may levy on the Curds and Turkmen, and his extortions from the villages and individuals; nor do the pachas come ſhort of this calculation. Abdi Pacha, who governed 13 or 14 years ago, carried off, at the end of 15 months, upwards of £. 160,000, by laying under contribution every trade, even the very cleaners of tobacco-pipes; and very lately another of the ſame name has been obliged to fly for ſimilar oppreſſions. The former was rewarded by the divan with the command of an army againſt the Ruſſians; but if the latter has not enriched himſelf, he will be ſtrangled as an extortioner. Such is the ordinary progreſs of affairs in Turkey!

In conſequence of ſuch wretched government, the greater part of the pachalics in the empire are impoveriſhed and laid waſte. This is the caſe in particular with that of Aleppo. In the ancient *defters*, or regiſters of impoſts, upwards of 3200 villages were reckoned; but at preſent the collector can ſcarcely find 400. Such of our merchants as have reſided there 20 years, have themſelves ſeen the greater part of the environs of Aleppo became depopulated. The traveller meets with nothing but houſes in ruins, ciſterns rendered uſeleſs and fields abandoned. Thoſe who cultivated them are fled into the towns, where the population is abſorbed, but where at leaſt the individual conceals himſelf among the crowd from the rapacious hand of deſpotiſm.

ALERIA, Alalia, or Alaria, (anc. geog.), a town of Corſica, ſituated near the middle of the eaſt ſide of the iſland, on an eminence, near the mouth of the river Rotanus mentioned by Ptolemy; built by the Phocæans (Diodorus Siculus). Afterwards Sylla led a colony thither. It is now in ruins, and called *Aleria Diſtrutta.*

ALES (Alexander), a celebrated divine of the confeſſion of Augſbourg, born at Edinburgh the 23d of April 1500. He ſoon made a conſiderable progreſs in ſchool-divinity, and entered the liſts very early againſt Luther, this being then the great controverſy in faſhion, and the grand field wherein all authors young and old uſed to diſplay their abilities. Soon after, he had a ſhare in the diſpute which Patrick Hamilton maintained againſt the eccleſiaſtics, in favour of the new faith he had imbibed at Marpurgh. He endeavoured to bring him back to the Catholic religion; but this he could not effect, and even began himſelf to doubt about his own religion, being much affected by the diſcourſe of this gentleman, and ſtill more by the conſtancy he ſhowed at the ſtake, when David Beton archbiſhop of St Andrew's cauſed him to be burnt. Beginning thus to waver, he was himſelf perſecuted with ſo much violence, that he was obliged to retire into Germany, where he became at length a perfect convert to the Proteſtant religion. The change of religion which happened in England after the marriage of Henry VIII. with Anna Bullen, induced Ales to go to London in 1535. He was highly eſteemed by Cranmer archbiſhop of Canterbury, Latimer, and Thomas Cromwel, who were at that time in high favour with the king. Upon the fall of theſe favourites, he was obliged to return to Germany; where the elector of Brandenburg appointed him profeſſor of divinity at Francfort upon the Oder, in 1540. But leaving this place upon ſome diſguſt, he returned to Leipſic, where he was choſen profeſſor of divinity, and died in March 1565. He wrote a Commentary on St John, on the Epiſtles to Timothy, and on the Pſalms, &c.

ALESA, Alæsa, or Halesa, (anc. geog.), a town of Sicily, on the Tuſcan ſea, built, according to Diodorus Siculus, by Achronides of Herbita, in the ſecond year of the 94th Olympiad, or 403 years before Chriſt; ſituated on an eminence about a mile from the ſea: now in ruins. It enjoyed immunity from taxes under the Romans (Diodorus, Cicero). The inhabitants were called *Haleſini* (Cicero, Pliny); alſo *Aleſini*, and *Alæſini.*

ALESHAM, a ſmall neat town in Norfolk. It is 15 miles N. of Norwich, and 121 N. E. by N. of London. E. Long. 0. 30. N. Lat. 52. 53. The town conſiſts of about 400 pretty good houſes; but the ſtreets are narrow, though well paved.

ALESIA, (anc. geog.) called *Alexia* by Livy and others; a town of the Mandubii, a people of Celtic Gaul; ſituated, according to Cæſar, on a very high hill, whoſe foot was waſhed on two ſides by two rivers. the town was of ſuch antiquity, that Diodorus Siculus relates it was built by Hercules. It is ſuppoſed to be the city of *Aliſe*, in the duchy of Burgundy, not far from Dijon.

ALET, a town of France, in Lower Languedoc, with a biſhop's ſee. It is remarkable for its baths, and for the grains of gold and ſilver found in the ſtream which runs from the Pyrenean mountains, at the foot of which it ſtands. It is ſeated on the river Aude, 15 miles S. of Carcaſſone, and 37 N. W. of Narbonne. E. Long. 2. 5. N. Lat. 42. 59.

ALETRIS, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants, and in the natural method ranking under the 10th order, *Coronariæ.* The characters are: The *corolla* is monopetalous, funnel-ſhaped, hexangular, much corrugated, ſemiquinquefid, and perſiſtent; the *ſtamina* conſiſt of ſix ſubulated filaments, the length of the corolla, and inſerted into the baſe of the diviſions of the corolla; the antheræ are oblong and erect: The *piſtillum* has an ovate germen; the ſtylus ſubulated, and the length of the ſtamina; the ſtigma is trifid: The *pericarpium* is an ovated capſule, triquetrous, pointed, and triocular: The *ſeeds* are numerous. Of this genus botanical writers enumerate five

Species. 1. The farinoſa, a native of Virginia, and other parts of North America. 2. The capenſis, a native of the Cape of Good Hope. 3. The hyacinthoides, or Guinea aloe. 4. The zeylanica, or Ceylon aloe. 5. The fragrans, or tree-aloe, a native of Africa. Of theſe only the firſt is ſo hardy as to outlive the winter in Britain, unleſs placed in a ſtove; and even this requires to be ſheltered under a frame. The flowers appear in June or July, of a whitiſh green colour. The third and fifth produce fine ſpikes of white flowers; thoſe of the third kind appearing in July, of the fifth in March or April. By proper management the laſt kind becomes a ſtately plant, riſing to the height of 12 or 14 feet; the flowers open wide in the evening, and perfume the air of the ſtove. They ſend out one or two heads, or tufts, towards their tops, which may be cut off; and after they have lain a week in the ſtove to heal the wounded parts, they may be planted for increaſe. The other ſpecies ſeldom or never flower in Britain, nor does their appearance otherwiſe merit notice.

ALETUM, or Aleta, (anc. geog.), a town of Celtic Gaul, now extinct. From its ruins aroſe St Malo, in Brittany, at the diſtance of a mile. Its ruins are called *Guich Aleth* in the Britiſh.

ALEUROMANCY, the ſame with what was otherwiſe called *alphitomantia*, and *crithomanthia*, and means an ancient kind of divination performed by means of meal or flour.

ALEXANDER the great, king of Macedonia. His father Philip laid the plan of that extenſive empire, which his ſon afterwards executed.—Philip, having made himſelf maſter of Greece, began to caſt his eyes upon Perſia, with a view to retaliate upon that haughty empire the injuries of former times. It was the popular topic of the day. But this prince was cut off in the midſt of his enterpriſe. Such, however, was the influence of Alexander in the aſſembly of the Grecian ſtates, that he was created general of their combined forces in the room of his father. Having made every needful preparation, at the head of a veteran army he invaded Aſia. The lieutenants of Darius, who was then king of Perſia, oppoſed him at the river Granicus, where Alexander obtained a complete victory, after which he purſued his march through Aſia. At Iſſus, near Scanderoon, he was met by Darius in perſon, at the head of a prodigious army. Here he obtained a ſecond victory; and took the camp of Darius, together with his family, whom he treated with the utmoſt humanity. Contrary to all the maxims of war, inſtead of purſuing Darius, he made an excurſion into Egypt; and, as far as appears, through no better motive than that of vanity. Here he was acknowledged to be the ſon of Jupiter Ammon. In the mean time Darius recruited his ſtrength, and got together an army ſuperior to what he brought into the plain of Iſſus. Alexander having finiſhed his Egyptian expedition, traverſed Aſia, and paſſed the Euphrates. At Arbella, a town in Aſſyria, he met Darius. Here a deciſive battle was fought, which put all Perſia into the hands of Alexander. His ambition not being ſatisfied with the conqueſt of that vaſt country, he projected an expedition into India. Here he met with great oppoſition from Porus, a gallant prince, whom in the end he reduced. Beyond the Ganges lay a country ſtill unſubdued. He notified it to his army, that he propoſed to paſs the river. But theſe veterans, harraſſed with the fatigues, and ſeeing no end to their labour, mutinied, and refuſed to march further. The diſappointed chief was therefore obliged to return. At Babylon he propoſed to receive ambaſſadors, appoint governors, and ſettle his vaſt monarchy; but his exceſſes put an end to his life in the midſt of his deſigns, and in the flower of his age.

The character of this hero is ſo familiar to every body, that it is almoſt needleſs labour to draw it. All the world knows, ſays Mr Bayle, that it was equally compoſed of very great virtues and very great vices. He had no mediocrity in any thing but his ſtature: in his other properties, whether good or bad, he was all extremes. His ambition roſe even to madneſs. His father was not at all miſtaken in ſuppoſing the bounds of Macedon too ſmall for his ſon: for how could Macedon bound the ambition of a man, who reckoned the whole world too ſmall a dominion? He wept at hearing the philoſopher Anaxarchus ſay, that there was an infinite number of worlds: his tears were owing to his deſpair of conquering them all, ſince he had not yet been able to conquer one. Livy, in a ſhort digreſſion, has attempted to enquire into the events which might have happened, if Alexander, after the conqueſt of Aſia, had brought his arms into Italy? Doubtleſs things might have taken a very different turn with him; and all the grand projects, which ſucceeded ſo well againſt an effeminate Perſian monarch, might eaſily have miſcarried if he had had to do with rough hardy Roman armies. And yet the vaſt aims of this mighty conqueror, if ſeen under another point of view, may appear to have been confined in a very narrow compaſs; ſince, as we are told, the utmoſt wiſh of that great heart, for which the whole earth was not big enough, was, after all, to be praiſed by the Athenians; for it is related, that the difficulties which he encountered in order to paſs the Hydaſpes, forced him to cry out, "O Athenians, could you believe to what dangers I expoſe myſelf for the ſake of being celebrated by you?" But Bayle affirms, that this was quite conſiſtent with the vaſt unbounded extent of his ambition, as he wanted to make all future time his own, and be an object of admiration to the lateſt poſterity; yet did not expect this from the conqueſts of worlds, but from books. He was perfectly in the right, ſays Bayle; "for if Greece had not furniſhed him with good writers, he would long ago have been as much forgotten as the kings who reigned in Macedon before Amphitryon."

Alexander has been praiſed upon the ſcore of continency, yet his life could not ſurely be quite regular in that reſpect. Indeed the fire of his early youth appeared ſo cold towards women, that his mother ſuſpected him to be impotent; and, to ſatisfy herſelf in this point, did, with the conſent of Philip, procure a very handſome courtezan to lie with him, whoſe careſſes, hovever, were all to no purpoſe. His behaviour afterwards to the Perſian captives ſhows him to have had a great command over himſelf in this particular. The wife of Darius was a finiſhed beauty; her daughters likewiſe were all beauties; yet this young prince, who had them in his power, not only beſtowed on them all the honours due to their high rank, but managed their reputation with the utmoſt delicacy. They were kept as in a cloyſter concealed from the world, and ſecured from the reach of every diſhonourable (not only attack, but) imputation. He did not give the leaſt handle to ſcandal, either by his viſits, his looks, or his words: and for other Perſian dames his priſoners, equally beautiful in face and ſhape, he contented himſelf with ſaying gaily, that they gave indeed much pain to his eyes. The amazon Thaleſtris could not obtain from him a compliance with her gallant requeſt till after a delay of thirteen days. In the mean time, what are we to conclude from his cauſing his favourite miſtreſs Pancaſte to be drawn naked by Apelles, though it is true he gave her to the painter, who fell in love with her? What of that immoderate love of boys, which Athenæus relates of him? What of that prodigious number of wives and concubines which he kept?

His exceſſes with regard to wine were notorious, and beyond all imagination; and he committed, when drunk, a thouſand extravagancies. It was owing to wine, that he killed Clytus who ſaved his life, and burnt Perſepolis, one of the moſt beautiful cities of the Eaſt: he did this laſt indeed at the inſtigation of the courtezan Thais; but this circumſtance made it only the more heinous. It is generally believed, that he died by drinking immoderately: and even Plutarch, who affects to contradict it, owns that he did nothing but drink the whole day he was taken ill.

In ſhort, to ſum up the character of this prince, we cannot be of opinion, that his good qualities did in any wiſe compenſate for his bad ones. Heroes make a noiſe: their actions glare, and ſtrike the ſenſes forcibly; while the infinite deſtruction and miſery they occaſion lies more in the ſhade, and out of ſight. One good legiſlator is worth all the heroes that ever did or will exiſt. See MACEDON.

ALEXANDER AB ALEXANDRO, a Neapolitan lawyer, of great learning, who flouriſhed toward the end of the 15th and beginning of the 16th century. He followed the profeſſion of the law firſt at Naples, afterwards at Rome: but he devoted all the time he could ſpare to the ſtudy of polite literature; and at length he entirely left the bar, that he might lead a more eaſy and agreeable life with the muſes. The particulars of his life are to be gathered from his work intitled *Genialium Dierum:* We are there informed, that he lodged at Rome, in a houſe that was haunted; and he relates many ſurpriſing particulars about the ghoſt: he ſays alſo, that when he was very young, he went to the lectures of Philelphus, who explained at Rome the Tuſculan queſtions of Cicero; he was there alſo when Nicholas Perot and Domitius Calderinus read their lectures upon Martial. The particular time when he died is not known; but he was buried in the monaſtery of the Olivets. Tiraquea wrote a learned commentary upon his work, which was printed at Lyons in 1587, and reprinted at Leyden in 1673, with the notes of Dennis Godfrey, Chriſtopher Colerus, and Nicholas Mercerus.

Alexander (Neckham), an eminent Engliſh writer in the 12th and 13th centuries, born at St Albans in Hertfordſhire. In 1215 he was made abbot of Exeter, and died in 1227. He wrote ſeveral works, which were never publiſhed; but they are to be found in manuſcript in the libraries of England and other countries.

Alexander (Noel) an indefatigable writer of the 17th century, born at Roan in Normandy, 1639. After finiſhing his ſtudies at Roan, he entered into the order of Dominican friars, and was profeſſed there in 1655. Soon after he went to Paris, to go through a courſe of philoſophy and divinity in the great convent, where he diſtinguiſhed himſelf ſo, that he was appointed to teach philoſophy there, which he did for 12 years. Mr Colbert ſhowed him many marks of his eſteem; and being determined to omit nothing to perfect the education of his ſon, afterwards archbiſhop of Roan, he formed an aſſembly of the moſt learned perſons, whoſe conferences upon eccleſiaſtical hiſtory might be of advantage to him. Father Alexander was invited to his aſſembly, where he exerted himſelf with ſo much genius and ability, that he gained the particular friendſhip of young Colbert, who ſhowed him the utmoſt regard as long as he lived. Theſe conferences gave riſe to Alexander's deſign of writing an eccleſiaſtical hiſtory; for, being deſired to reduce what was material in theſe conferences to writing, he did it with ſo much accuracy, that the learned men who compoſed this aſſembly, adviſed him to undertake a complete body of church-hiſtory. This he executed with great aſſiduity, collecting and digeſting the materials himſelf, and writing even the tables with his own hand. He at laſt completed his work in 1686. Towards the latter part of his life, he was afflicted with the loſs of his ſight; a moſt inexpreſſible misfortune to one whoſe whole pleaſure was in ſtudy, yet he bore it with great patience and reſignation. He died merely of a decay of nature, 1724, in the 86th year of his age.

Alexander Severus, emperor of Rome, ſucceeded Heliogabalus about A. D. 222, when but 16 years of age. His mother's name was Mammæa, and by her advice he in a great meaſure regulated his conduct. He applied himſelf to the reformation of abuſes, the ſtate having been greatly diſordered by the vicious conduct of his predeceſſor; he was a moſt ſtrict lover of juſtice, an encourager of learning and learned men, and favourable to the Chriſtians. He made a ſucceſsful expedition againſt the Perſians; but endeavouring to reform his troops, which had grown very licentious under the late bad government, they murdered him at the inſtigation of Maximinus in the 29th year of his age, together with his mother, A. D. 235.

Alexander VI. (Pope), had four baſtards when he was cardinal, for one of which he had ſo great affection, that he ſtuck at nothing to raiſe him. Deſigning to poiſon ſome cardinals, he was poiſoned himſelf, A. D. 1503. See Borgia.

Alexander VII. (Pope). See Chigi.

Alexander, biſhop of Lincoln in the reigns of Henry I. and Stephen, was a Norman by birth, and nephew of the famous Roger, biſhop of Saliſbury, who firſt made him archdeacon of Saliſbury, and afterwards, by his intereſt with the king, raiſed him to the mitre. Alexander was conſecrated at Canterbury, July 22. 1123. Having received his education under his uncle the biſhop of Saliſbury, and been accuſtomed to a ſplendid way of living, he affected ſhow and ſtate more than was ſuitable to his character, or conſiſtent with his fortunes. This failing excepted, he was a man of worth and honour, and every way qualified for his ſtation. The year after his conſecration, his cathedral church at Lincoln having been accidentally burnt down, he rebuilt it, and ſecured it againſt the like accident for the future by a ſtone roof. This prelate increaſed the number of prebends in his church, and augmented its revenues with ſeveral manors and eſtates. In imitation of the barons and ſome of the biſhops, particularly his uncle the biſhop of Saliſbury, he built three caſtles; one at Banbury, another at Sleaford, and a third at Newark. He likewiſe founded two monaſteries; one at Haverholm, for regular canons and nuns together, the other at Tame for white-friars. He went twice to Rome in the years 1142 and 1144. The firſt time, he came back in quality of the pope's legate, for the calling a ſynod, in which he publiſhed ſeveral wholeſome and neceſſary canons. In Auguſt 1147, he took a third journey to the pope, who was then in France; where he fell ſick through the exceſſive heat of the weather, and returning with great difficulty to England, he died in the 24th year of his prelacy.

Alexander (William), earl of Stirling, an eminent Scots ſtateſman and poet in the reigns of James VI. and Charles I. who, after travelling with the duke of Argyle as his tutor or companion, wrote a poetical complaint of his unſucceſsful love of ſome beauty, under the title of *Aurora*. He then removed to the court of James VI. where he applied to the more ſolid parts of poetry, forming himſelf upon the plan of the Greek and Roman tragedians. In 1607, he publiſhed ſome dramatic performances, intitled *The Monarchic Tragedies*, dedicated to king James; who was ſo well pleaſed with them, as to call him his philoſophical poet. After this, he is ſaid to have written *a ſupplement* to complete the third part of Sir Philip Sidney's Arcadia; and in 1613, he produced a poem called *Doomſday, or the Great Day of Judgment*. He was made gentleman-uſher to prince Charles, and maſter of the requeſts; was knighted; and obtained a grant of Nova Scotia, where he projected the ſettlement of a colony, but afterwards ſold it to the French. In 1626, he was made ſecretary of ſtate for

Scotland ; was created firſt viſcount, and then earl, of Stirling ; and died in 1640.

Alexander I. (St), whom St Irenæus reckons the fifth biſhop of Rome, ſucceeded St Evariſtus in the year 109, and died in the year 119. There is no account of his life ; and the epiſtles which are attributed to him are ſuppoſitious.

Alexander II. king of Scotland, ſucceeded his father William in 1213, at 16 years of age. He made an expedition into England, to oppoſe the tyranny of king John ; who returned the viſit, and was offered battle by Alexander, but refuſed it. He took the city of Carliſle from Henry III. which was afterwards exchanged for Berwick. Alexander died in 1249, in the 51ſt year of his age, and 35th of his reign ; and left for his ſucceſſor, his ſon——

Alexander III. who was crowned king of Scotland in 1249. The Cummings, lords of Scotland, took arms againſt him ; and taking him priſoner, confined him at Striveling : but he was afterwards releaſed by his ſubjects. He married the daughter of Henry III. king of England ; and was at length killed by a fall from his horſe, on the 10th of April 1290, after having reigned 42, or according to others 37, years.

ALEXANDERS, in botany. See Smyrnium.

ALEXANDREA, (anc. geog.), a mountain of Myſia, on the ſea-coaſt, forming a part of mount Ida, where Paris gave judgment on the three goddeſſes.

ALEXANDRETTA, by the Turks called *Scanderoon* : a town in Syria, at the extremity of the Mediterranean ſea. It is the port of Aleppo, from which it is diſtant 28 or 30 leagues. It is now, properly ſpeaking, nothing elſe but a village, without walls, in which the tombs are more numerous than the houſes, and which entirely owes its exiſtence to the road which it commands. This is the only road, in all Syria, where veſſels anchor on a ſolid bottom, without their cables being liable to chafe : but in other reſpects it has many inconveniences. It is infeſted, during winter, by a peculiar wind, called by the French ſailors *le Raguier*, which, ruſhing from the ſnowy ſummits of the mountains, frequently forces ſhips to drag their anchors ſeveral leagues : And when the ſnow begins to cover the mountains which ſurround the Gulph, tempeſtuous winds ariſe which prevent veſſels from entering for three or four months together. The road alſo to Aleppo by the plain is infeſted by Curd robbers, who conceal themſelves in the neighbouring rocks, and frequently attack and plunder the ſtrongeſt caravans. But the worſt circumſtance is the extreme unwholeſomneſs of the air, occaſioned here by ſtagnant waters and mephitic exhalations. It may be affirmed, that this every year carries off one-third of the crew of the veſſels which remain here during the ſummer ; nay, ſhips frequently loſe all their men in two months. The ſeaſon for this epidemic diſorder is principally from May to the end of September : it is an intermitting fever of the moſt malignant kind ; and is accompanied with obſtructions of the liver, which terminate in a dropſy. To this baneful epidemic, Alexandretta, from its ſituation, ſeems to be irremediably condemned : for the plain on which the town is built is ſo low and flat, that the rivulets, finding no declivity, can never reach the ſea. When they are ſwelled by the winter rains, the ſea, ſwelled likewiſe by tempeſts, hinders their diſcharging themſelves into it : hence their waters, forced to ſpread themſelves, form lakes in the plain. On the approach of the ſummer, the waters becoming corrupted by the heat, exhale vapours equally corrupt, and which cannot diſperſe, being confined by the mountains that encircle the gulph. The entrance of the bay beſides lies to the weſt, which in thoſe countries is the moſt unhealthy expoſure when it correſponds with the ſea. The labour neceſſary to remedy this would be immenſe, and after all inſufficient ; and, indeed, ſuch an undertaking would be abſolutely impoſſible under a government like that of the Turks. A few years ago, Mr Volney informs us, the merchants of Aleppo, diſguſted with the numerous inconveniences of Alexandretta, wiſhed to abandon that port and carry the trade to Latakia. They propoſed to the Pacha of Tripoli to repair the harbour at their own expence, provided he would grant them an exemption from all duties for ten years. To induce him to comply with their requeſt, the agent they employed talked much of the advantage which would, *in time*, reſult to the whole country : "But what ſignifies it to me what may happen *in time*, replied the Pacha ? I was yeſterday at Marach ; tomorrow, perhaps, I ſhall be at Djedda : Why ſhould I deprive myſelf of preſent advantages, which are certain, for future benefits I cannot hope to partake ?" The European factors were obliged therefore to remain at Scanderoon. There are three of theſe factors, two for the French, and one for the Engliſh and Venetians. The only curioſity which they have to amuſe ſtrangers with, conſiſts in ſix or ſeven marble monuments, ſent from England, on which you read : *Here lies ſuch a one, carried off in the flower of his age, by the fatal effects of a contagious air.* The ſight of theſe is the more diſtreſſing, as the languid air, yellow complexion, livid eyes, and dropſical bellies of thoſe who ſhow them, make it but too probable they cannot long eſcape the ſame fate. It is true, they have ſome reſource in the village of Bailan, the pure air and excellent waters of which ſurprizingly reſtore the ſick. The aga, for ſome years paſt, has applied the duties of the cuſtom-houſe of Alexandretta to his own uſe, and rendered himſelf almoſt independent of the Pacha of Aleppo. The Turkiſh empire is full of ſuch rebels, who frequently die in peaceable poſſeſſion of their uſurpations.

ALEXANDRIA, now *Scanderia*, by Athenæus called Χρυση ; a city of Lower Egypt, and for a long time its capital. This city was built by Alexander the Great, ſoon after the overthrow of Tyre, about 333 years before Chriſt. It is ſituated on the Mediterranean, twelve miles weſt of that mouth of the Nile anciently called *Canopicum* ; and lies in E. Long. 30. 19. N. Lat. 31. 10.

Alexander is ſaid to have been induced to build this city, on account of its being conveniently ſituated for a fine port ; and ſo ſudden was his reſolution, that after he had directed where every public ſtructure was to be placed, fixed the number of temples, and the deities to whom they ſhould be dedicated, &c. there were no inſtruments at hand proper for making out the walls, according to the cuſtom of thoſe times. Upon this, a workman adviſed the king to collect what meal was among the ſoldiers, and to ſift it in lines upon the ground, whereby the circuit of the walls would be ſufficiently marked out. This advice was followed ;

and the new method of marking out the walls was, by Ariſtander, the king's ſoothſayer, interpreted as a preſage of the city's abounding with all the neceſſaries of life. Nor was he deceived in his prediction; for Alexandria ſoon became the ſtaple, not only for merchandiſe, but alſo for all the arts and ſciences of the Greeks.

Alexandria was a league and a half long, by one-third in breadth, which made the circumference of its walls about four leagues. Lake Mareotis bathed its walls on the ſouth, and the Mediterranean on the north. It was interſected lengthwiſe by ſtraight parallel ſtreets. This direction left a free paſſage to the northerly wind, which alone conveys coolneſs and ſalubrity into Egypt. A ſtreet of 2000 feet wide began at the gate of the ſea, and terminated at the gate of Canopus. It was decorated by magnificent houſes, by temples, and by public buildings. In this extenſive range, the eye was never tired with admiring the marble, the porphyry, and the obeliſks, which were deſtined at ſome future day to embelliſh Rome and Conſtantinople. This ſtreet, the handſomeſt in the univerſe, was interſected by another of the ſame breadth, which formed a ſquare at their junction of half a league in circumference. From the middle of this great place, the two gates were to be ſeen at once, and veſſels arriving under full ſail from the north and from the ſouth.

A mole of a mile in length ſtretched from the continent to the iſle of Pharos, and divided the great harbour into two. That which is to the northward preſerved its name. A dyke drawn from the iſland to the rock whereon was built the Pharos, ſecured it from the weſterly winds. The other was called *Eunoſtos*, or the Safe Return. The former is called at preſent the new, the latter the old harbour: a bridge that joins the mole to the city, ſerved for a communication between them. It was raiſed on lofty pillars ſunk into the ſea, and left a free paſſage for ſhips. The palace, which advanced beyond the promontory of *Lochias*, extended as far as the dyke, and occupied more than a quarter of the city. Each of the Ptolemies added to its magnificence. It contained within its incloſure, the muſeum, an aſylum for learned men, groves, and buildings worthy of royal majeſty, and a temple where the body of Alexander was depoſited in a golden coffin. The infamous Seleucus Cibyoſactes violated this monument, carried off the golden coffin, and put a glaſs one in its place. In the great harbour was the little iſland of Anti-Rhodes, where ſtood a theatre, and a royal place of reſidence. Within the harbour of Eunoſtos was a ſmaller one, called Kibotos, dug by the hand of man, which communicated with Lake Mareotis by a canal. Between this canal and the palace was the admirable temple of Serapis, and that of Neptune near the great place where the market was held. Alexandria extended likewiſe along the ſouthern banks of the lake. Its eaſtern part preſented to view the gymnaſium, with its porticoes of more than 600 feet long, ſupported by ſeveral rows of marble pillars. Without the gate of Canopus was a ſpacious circus for the chariot races. Beyond that, the ſuburb of Nicopolis ran along the ſea-ſhore, and ſeemed a ſecond Alexandria. A ſuperb amphitheatre was built there with a race-ground, for the celebration of the quinquennalia.

Such is the deſcription left us of Alexandria by the ancients, and above all by Strabo.

The architect employed by Alexander in this undertaking was the celebrated Dinocrates, who had acquired ſo much reputation by rebuilding the temple of Diana at Epheſus. The city was firſt rendered populous by Ptolemy Soter, one of Alexander's captains, who, after the death of the Macedonian monarch, being appointed governor of Egypt, ſoon aſſumed the title of king, and took up his reſidence at Alexandria, about 304 years before Chriſt.

In the 30th year of Ptolemy Soter's reign, he took his ſon Ptolemy Philadelphus partner with him in the empire; and by this prince the city of Alexandria was much embelliſhed. In the firſt year of his reign the famous watch-tower of Pharos was finiſhed. It had been begun ſeveral years before by Ptolemy Soter; and, when finiſhed, was looked upon as one of the wonders of the world. The ſame year, the iſland of Pharos itſelf, originally ſeven furlongs diſtant from the continent, was joined to it by a cauſeway. This was the work of Dexiphanes, who completed it at the ſame time that his ſon put the laſt hand to the tower. The tower was a large ſquare ſtructure of white marble; on the top of which, fires were kept conſtantly burning, for the direction of ſailors. The building coſt 800 talents; which, if Attic, amounted to L.165,000 ſterl. if Alexandrian, to twice that ſum.

The architect employed in this famous ſtructure fell upon the following contrivance to uſurp the whole glory to himſelf.—Being ordered to engrave upon it the following inſcription, "King PTOLEMY to the Gods the Saviours, for the benefit of Sailors;" inſtead of the king's name he ſubſtituted his own, and then filling up the hollow of the marble with mortar, wrote upon it the above mentioned inſcription. In proceſs of time, the mortar being wore off, the following inſcription appeared: "SOSTRATUS the CNIDIAN, the ſon of DEXIPHANES, to the Gods the Saviours, for the benefit of Sailors."

This year alſo was remarkable for the bringing of the image of Serapis from Pontus to Alexandria. It was ſet up in one of the ſuburbs of the city called *Rhacotis*, where a temple was afterwards erected to his honour, ſuitable to the greatneſs of that ſtately metropolis, and called, from the god worſhipped there, *Serapeum*. This ſtructure, according to Ammianus Marcellinus, ſurpaſſed in beauty and magnificence all others in the world, except the capitol at Rome.—— Within the verge of this temple was the famous Alexandrian library. It was founded by Ptolemy Soter, for the uſe of an academy he inſtituted in this city; and, by continual additions by his ſucceſſors, became at laſt the fineſt library in the world, containing no fewer than 700,000 volumes. The method followed in collecting books for this library, was, to ſeize all thoſe which were brought into Egypt by Greeks or other foreigners. The books were tranſcribed in the muſeum by perſons appointed for that purpoſe; the copies were then delivered to the proprietors, and the originals laid up in the library. Ptolemy Euergetes, having borrowed from the Athenians the works of Sophocles, Euripides, and Æſchylus, returned them only the copies, which he cauſed to be tranſcribed in as beautiful a manner as poſſible; preſenting the Athenians at the ſame time with fifteen talents (upwards of L. 3000 Sterling) for the exchange.

As the muſeum was at firſt in that quarter of the city called *Bruchion*, near the royal palace, the library was placed there likewiſe; but when it came to contain 400,000 volumes, another library, within the Serapeum, was erected, by way of ſupplement to it, and on that account called the *daughter* of the former. In this ſecond library 300,000 volumes, in proceſs of time, were depoſited; and the two together contained the 700,000 volumes already mentioned. In the war carried on by Julius Cæſar againſt the inhabitants of this city, the library in the Bruchion, with the 400,000 volumes contained in it, was reduced to aſhes. The library in the Serapeum, however, ſtill remained; and here Cleopatra depoſited 200,000 volumes of the Pergamean library, which Marc Antony preſented her with. Theſe, and others added from time to time, rendered the new library at Alexandria more numerous and conſiderable than the former; and though it was often plundered during the revolutions and troubles of the Roman empire, yet it was again and again repaired, and filled with the ſame number of books.

For 293 years Alexandria was held in ſubjection by the Ptolemies. Here is a liſt of theſe princes, with the dates of their reſpective reigns.

Ptolemy the ſon of Laugus, ſurnamed *Soter*, reigned 39 years, and died in the year of the world 3720. Ptolemy Philadelphus reigned 39 years, and died in 3758. Ptolemy Euergetes reigned 25 years, and died in 3783. Ptolemy Philopater reigned 17 years, and died in 3800. Ptolemy Epiphanes reigned 24 years, and died in 3824. Ptolemy Philometer reigned 37 years, and died in 3861. Ptolemy Euergetes, or Phyſcon, reigned 53 years, part with his brother Philometer and part alone. He died in 3888. Ptolemy Lathyrus reigned 36 years ſix months. He died in 3923. Cleopatra, the daughter of Lathyrus and wife of Alexander I. reigned ſix months. Alexander I. the nephew of Lathyrus, was eſtabliſhed in 3924, and died in 3943. Alexander II. the ſon of Alexander I. was diſpoſſeſſed by the Alexandrians in 3939. Ptolemy Nothus, or Auletes, the ſon of Lathyrus, reigned 13 years and died in 3953. Ptolemy, ſurnamed *Dionyſius* or *Bacchus*, reigned three years eight months, and died in 3957. Cleopatra reigned from 3957, and killed herſelf in 3974.

This city as we have already obſerved, ſoon became extremely populous, and was embelliſhed both by its own princes and the Romans; but, like moſt other noted cities of antiquity, hath been the ſeat of terrible maſſacres. About 141 years before Chriſt, it was almoſt totally depopulated by Ptolemy Phyſcon. That barbarous monſter, without the leaſt provocation, gave free liberty to his guards to plunder his metropolis and murder the inhabitants at their pleaſure. The cruelties practiſed on this occaſion cannot be expreſſed; and the few who eſcaped were ſo terrified that they fled into other countries. Upon this, Phyſcon, that he might not reign over empty houſes, invited thither ſtrangers from the neighbouring countries; by whom the city was repeopled, and ſoon recovered its former ſplendor. On this occaſion many learned men having been obliged to fly, proved the means of reviving learning in Greece, Aſia Minor, the iſlands of the Archipelago, and other places, where it was almoſt totally loſt.

The new inhabitants were not treated with much more kindneſs by Phyſcon than the old ones had been; for, on their complaining of his tyrannical behaviour, he reſolved on a general maſſacre of the young men. Accordingly, when they were one day aſſembled in the gymnaſium, or place of their public exerciſes, he ordered it to be ſet on fire; ſo that they all periſhed, either in the flames, or by the ſwords of his mercenaries, whom the tyrant had placed at all the avenues.

Though Julius Cæſar was obliged to carry on a war for ſome time againſt this city, it ſeems not to have ſuffered much damage, except the burning of the library already mentioned. Before Cæſar left Alexandria, in acknowledgment of the aſſiſtance he had received from the Jews, he confirmed all their privileges there, and even engraved his decree on a pillar of braſs. This, however, did not prevent the maſſacre of 50,000 of them in this city about the year of Chriſt 67.

The city of Alexandria ſeems to have fallen into decay ſoon after this, and to have forfeited many of its ancient privileges, tho' for what offence is not known; but when Adrian viſited Egypt, about the year 141, it was almoſt totally ruined. He repaired both the public and private buildings, not only reſtoring the inhabitants to their ancient privileges, but heaping new favours upon them; for which they returned him their ſolemn thanks, and conferred upon him what honours they could while he was preſent; but as ſoon as he was gone, they publiſhed the moſt bitter and virulent lampoons againſt him.

The fickle and ſatirical humour of the Alexandrians was highly diſliked by Adrian, though he inflicted no puniſhment upon them for it; but when they lampooned Caracalla, he did not let them eſcape ſo eaſily. That tyrant, in the year 215, when he viſited their city, having become the ſubject of their fooliſh ſatires, ordered a general maſſacre by his numerous troops, who were diſperſed all over the city. The inhuman orders being given, all were murdered, without diſtinction of age or ſex; ſo that in one night's time the whole city floated in blood, and every houſe was filled with carcaſes. The monſter who occaſioned this had retired during the night to the temple of Serapis, to implore the protection of that deity; and, not yet ſatiated with ſlaughter, commanded the maſſacre to be continued all the next day; ſo that very few of the inhabitants remained. As if even this had not been ſufficient, he ſtripped the city of all its ancient privileges; ſuppreſſed the academy; ordered all ſtrangers who lived there to depart; and that the few who remained might not have the ſatisfaction of ſeeing one another, he cut off all communication of one ſtreet with another, by walls built for that purpoſe, and guarded by troops left there.

Notwithſtanding this terrible diſaſter, Alexandria ſoon recovered its former ſplendor, as Caracalla was murdered a ſhort time after. It was long eſteemed the firſt city in the world, next to Rome; and we may judge of its magnificence, and the multitude of people contained in it, from the account of Diodorus Siculus, who relates, that in his time (44 years before Chriſt) Alexandria had on its rolls 300,000 freemen. Towards the middle of the ſixth century, Amrou *Ebn el Aas*, Omar's general, took it by ſtorm, after a ſiege of 14 months, and with the loſs of 23,000 men. Heraclius, then emperor of Conſtantinople, did not ſend a ſingle ſhip to its aſſiſtance. This prince affords an example very rare in hiſtory; he had diſplayed ſome vigour in the firſt year of his reign, and then ſuffered himſelf to be lulled into idleneſs and effeminacy. Awakened ſuddenly from his lethargy by the noiſe of the conqueſts of Coſroes, that ſcourge of the eaſt, he put himſelf at the head of his armies, diſtinguiſhed himſelf as a great captain from his very firſt campaign, laid waſte Perſia for ſeven years, and returned to his capital covered with laurels: he then became a theologian on the throne, loſt all his energy, and amuſed himſelf the reſt of his life with diſputing upon Monotheiſm, whilſt the Arabs were robbing him of the fineſt provinces of his empire. Deaf to the cries of the unfortunate inhabitants of Alexandria, as he had been to thoſe of the people of Jeruſalem, who defended themſelves for two years, he left them a ſacrifice to the fortunate aſcendancy of the indefatigable Amrou. All their intrepid youth periſhed with their arms in their hands.

The victor, aſtoniſhed at his conqueſt, wrote to the caliph, "I have taken the city of the weſt. It is of an immenſe extent. I cannot deſcribe to you how many wonders it contains. There are 4000 palaces, 4000 baths, 12,000 dealers in freſh oil, 12,000 gardeners, 40,000 Jews who pay tribute, 400 comedians," &c.

At this time, according to the Arabian hiſtorians, Alexandria conſiſted of three cities, *viz. Menna*, or the port, which included Pharos, and the neighbouring parts; *Alexandria*, properly ſo called, where the modern Scanderia now ſtands; and *Nekita*, probably the Necropolis of Joſephus and Strabo.

At that time John, ſurnamed *the grammarian*, a famous Peripatetic philoſopher, being in the city, and in high favour with Amrou Ebn al Aas the Saracen general, begged of him the royal library. Amrou replied, that it was not in his power to grant ſuch a requeſt; but that he would write to the Khalif on that head; ſince, without knowing his pleaſure, he dared not to diſpoſe of a ſingle book. He accordingly wrote to Omar, who was then Khalif, acquainting him with the requeſt of his friend: To which the ignorant tyrant replied, That if thoſe books contained the ſame doctrine with the koran, they could be of no uſe, ſince the koran contained all neceſſary truths; but if they contained any thing contrary to that book, they ought not to be ſuffered; and therefore, whatever their contents were, he ordered them to be deſtroyed. Purſuant to this order, they were diſtributed among the public baths; where, for the ſpace of ſix months, they ſerved to ſupply the fires of thoſe places, of which there was an incredible number in Alexandria.

After the city was taken, Amrou thought proper to purſue the Greeks who had fled farther up the country; and therefore marched out of Alexandria, leaving but a very ſlender garriſon in the place. The Greeks, who had before fled on board their ſhips, being appriſed of this, returned on a ſudden, ſurprized the town, and put all the Arabs they found therein to the ſword: but Amrou, receiving advice of what had happened, ſuddenly returned, and drove them out of it with great ſlaughter; after which the Greeks were ſo intimidated, that he had nothing farther to fear from them.—A few years after, however, Amrou being deprived of his government by the khalif Othman, the Egyptians were ſo much diſpleaſed with his diſmiſſion that they inclined to a revolt; and Conſtantine the Greek emperor, having received intelligence of their diſaffection, began to meditate the reduction of Alexandria. For this purpoſe, he ſent one Manuel, an eunuch, and his general, with a powerful army, to retake that place; which, by the aſſiſtance of the Greeks in the city, who kept a ſecret correſpondence with the imperial forces while at ſea, and joined them as ſoon as they had made a deſcent, he effected, without any conſiderable effuſion of Chriſtian blood. The khalif, now perceiving his miſtake, immediately reſtored Amrou to his former dignity. This ſtep was very agreeable to the natives; who having had experience of the military ſkill and bravery of this renowned general, and apprehending that they ſhould be called to an account by the Greeks for their former perfidious conduct, had petitioned Othman to ſend him again into Egypt.—Upon Amrou's arrival, therefore, at Alexandria, the Copts or natives, with the traitor Al-Mokawkas (who had formerly betrayed to Amrou the fortreſs of Meſr) at their head, not only joined him, but ſupplied him with all kinds of proviſions, exciting him to attack the Greeks without delay. This he did; and, after a moſt obſtinate diſpute which laſted ſeveral days, drove them into the town, where, for ſome time, they defended themſelves with great bravery, and repelled the utmoſt efforts of the beſiegers. This ſo exaſperated Amrou, that he ſwore, "If God enabled him to conquer the Greeks, he would throw down the walls of the city, and make it as eaſy of acceſs as a *bawdy-houſe*, which lies open to every body." Nor did he fail to execute this menace; for having taken the town by ſtorm, he quite diſmantled it, entirely demoliſhing the walls and fortifications. The lives of the citizens, however, were ſpared, at leaſt as far as lay in the general's power; but many of them were put to the ſword by the ſoldiers on their firſt entrance. In one quarter particularly, Amrou found them butchering the Alexandrians with unrelenting barbarity; to which, however, by his ſeaſonable interpoſition, he put a ſtop, and on that ſpot erected a moſque, which he called the *moſque of mercy*.

From this time Alexandria never recovered its former ſplendor. It continued under the dominion of the khalifs till the year 924, when it was taken by the Magrebians, two years after its great church had been deſtroyed by fire. This church was called by the Arabs *Al Kaiſaria*, or *Cæſarea*; and had formerly been a pagan temple, erected in honour of Saturn by the famous queen Cleopatra.

The city was ſoon after abandoned by the Magrebians; but in 928 they again made themſelves maſters of it: their fleet being afterwards defeated by that belonging to the khalif, *Abul Kâſem* the Magrebian general retired from Alexandria, leaving there only a garriſon of 300 men; of which *Thmall*, the khalif's admiral, being appriſed, he in a few days appeared before the town, and carried off the remainder of the inhabitants to an iſland in the Nile called *Abukair*. This was done, to prevent Abul Kâſem from meeting with any entertainment at Alexandria, in caſe he ſhould think proper to return. According to Eutychius, above

200,000 of the miſerable inhabitants periſhed this year.

What contributed to raiſe Alexandria to ſuch a prodigious height of ſplendor as it enjoyed for a long time, was its being the centre of commerce between the eaſtern and weſtern parts of the world. It was with the view of becoming maſter of this lucrative trade, that Alexander built this city, after having extirpated the Tyrians, who formerly engroſſed all the Eaſt-India traffic. Of the immenſe riches which that trade afforded, we may form an idea, from conſidering that the Romans accounted it a point of policy to oppreſs the Egyptians, eſpecially the Alexandrians; and after the defeat of Zenobia, there was a ſingle merchant of Alexandria who undertook to raiſe and pay an army out of the profits of his trade. The Greek emperors drew prodigious tributes from Egypt, and yet the khalifs found their ſubjects in ſo good circumſtances as to ſcrew up their revenues to three hundred millions of crowns.

Though the revolutions which happened in the government of Egypt, after it fell into the hands of the Mahometans, frequently affected this city to a very great degree; yet ſtill the excellence of its port, and the innumerable conveniences reſulting from the Eaſt-India trade, to whomſoever were maſters of Egypt, preſerved Alexandria from total deſtruction, even when in the hands of the moſt barbarous nations. Thus, in the 13th century, when the barbariſm introduced by the Goths, &c. began to wear off from the European nations, and they acquired a taſte for the elegancies of life, the old mart of Alexandria began to revive; and the port, though far from recovering its former magnificence, grew once more famous by becoming the centre of commerce; but having fallen under the dominion of the Turks, and the paſſage round the Cape of Good Hope being diſcovered by the Portugueſe in 1499, a fatal blow was given to the Alexandrian commerce, and the city has ſince fallen into decay.

At preſent, the city of Alexandria is reckoned to have about 14,000 or 15,000 inhabitants; a ſtrange colluvies of different nations, as well as from various parts of the Turkiſh empire. They are in general given to thieving and cheating; and (like their predeceſſors) ſeditious above all others, were they not kept in awe by the ſeverity of their government. The Britiſh and French carry on a conſiderable commerce with them, and have each a conſul reſiding here. Some Venetian ſhips alſo ſail thither yearly, but with French colours, and under the protection of France. The ſubjects of thoſe kingdoms which keep no conſul here, are ſubjected to a tax by the Grand Signior: But the Jews have found out the method of indemnifying themſelves for this advantage; namely, by ſelling their commodities cheaper than other foreigners can afford. They are alſo favoured by the farmers of the revenue; who know, that if they do not pay ſome private regard to them, the Jews have it in their power to cauſe fewer merchandizes come into their port during the two years that their farm laſts.

The preſent city is a kind of peninſula ſituated between the two ports. That to the weſtward was called by the ancients the *Portus Eunoſtos*, now the *Old Port*, and is by far the beſt; Turkiſh veſſels only are allowed to anchor there: the other, called the *New Port*, is for the Chriſtians; at the extremity of one of the arms of which ſtood the famous Pharos. The New Port, the only harbour for the Europeans, is clogged up with ſand, inſomuch that in ſtormy weather ſhips are liable to bilge; and the bottom being alſo rocky, the cables ſoon chafe and part; ſo that one veſſel driving againſt a ſecond, and that againſt a third, they are perhaps all loſt. Of this there was a fatal inſtance 16 or 18 years ago, when 42 veſſels were daſhed to pieces on the mole in a gale of wind from the north-weſt, and numbers have been ſince loſt there at different times. If it be aſked, Why do they not repair the New Port? the anſwer is, That in Turkey they deſtroy every thing, and repair nothing. The old harbour will be deſtroyed likewiſe, as the ballaſt of veſſels has been continually thrown into it for the laſt 200 years. The ſpirit of the Turkiſh government is to ruin the labours of paſt ages, and deſtroy the hopes of future times, becauſe the barbarity of ignorant deſpotiſm never conſiders to-morrow.

In time of war, Alexandria is of no importance; no fortification is to be ſeen; even the Farillon, with its lofty towers, cannot be defended. It has not four cannon fit for ſervice, nor a gunner who knows how to point them. The 500 janiſaries, who ſhould form the garriſon, reduced to half the number, know nothing but how to ſmoke a pipe. But Alexandria is a place of which the conqueſt would be of no value. A foreign power could not maintain itſelf there, as the country is without water. This muſt be brought from the Nile by the kalidj, or canal of 12 leagues, which conveys it thither every year at the time of the inundation. It fills the vaults or reſervoirs dug under the ancient city, and this proviſion muſt ſerve till the next year. It is evident, therefore, that were a foreign power to take poſſeſſion, the canal would be ſhut, and all ſupplies of water cut off. It is this canal alone which connects Alexandria with Egypt; for from its ſituation without the Delta, and the nature of the ſoil, it really belongs to the deſarts of Africa. Its environs are ſandy, flat, and ſterile, without trees and without houſes: where we meet with nothing but the plant which yields the kali, and a row of palm trees which follows the courſe of the kalidj or canal.

The city is governed like others in the ſame kingdom. (See Egypt.) It hath a ſmall garriſon of ſoldiers, part of which are Janiſaries and Aſſaſs; who are very haughty and inſolent, not only to ſtrangers, but to the mercantile and induſtrious part of the people, tho' ever ſo conſiderable and uſeful. The government is ſo remiſs in favour of theſe wretches, that Mr Norden informs us, one of them did not heſitate to kill a farmer of the cuſtoms, for refuſing to take leſs of him than the duty impoſed, and went off unpuniſhed; it being a common ſalvo among them, that what is done cannot be undone.

The preſent condition of Alexandria is very deſpicable, being now ſo far ruined, that the rubbiſh in many places overtops the houſes. The famous tower of Pharos has long ſince been demoliſhed, and a caſtle, called *Farillon*, built in its place. The cauſeway which joined the iſland to the continent is broken down, and its place ſupplied by a ſtone bridge of ſeveral arches.

Some parts of the old walls of the city are yet ſtanding, and preſent us with a maſterpiece of ancient maſonry. They are flanked with large towers, about 200 paces diſtant from each other, with ſmall ones in the middle. Below are magnificent caſemates, which may ſerve for galleries to walk in. In the lower part of the towers is a large ſquare hall, whoſe roof is ſupported by thick columns of Thebaic ſtone. Above this are ſeveral rooms, over which there are platforms more than 20 paces ſquare. The ancient reſervoirs, vaulted with ſo much art, which extend under the whole town, are almoſt entire, at the end of 2000 years.

Of Cæſar's palace there remain only a few porphyry pillars, and the front, which is almoſt entire, and looks very beautiful. The palace of Cleopatra was built upon the walls facing the port, having a gallery on the outſide, ſupported by ſeveral fine columns. Not far from this palace are two obeliſks vulgarly called *Cleopatra's Needles*. They are of Thebaic ſtone, and covered with hieroglyphics. One is overturned, broken, and lying under the ſand; the other is on its pedeſtal. Theſe two obeliſks, each of them of a ſingle ſtone, are about 60 feet high, by ſeven feet ſquare at the baſe. Towards the gate of Roſetta, are five columns of marble on the place formerly occupied by the porticoes of the Gymnaſium. The reſt of the colonnade, the deſign of which was diſcoverable 100 years ago by Maillet, has ſince been deſtroyed by the barbariſm of the Turks.

But what moſt engages the attention of travellers is the Pillar of Pompey, as it is commonly called, ſituated at a quarter of a league from the ſouthern gate. It is compoſed of red granite. The capital is Corinthian, with palm leaves, and not indented. It is nine feet high. The ſhaft and the upper member of the baſe are of one piece of 90 feet long, and 9 in diameter. The baſe is a ſquare of about 15 feet on each ſide. This block of marble, 60 feet in circumference, reſts on two layers of ſtone bound together with lead; which, however, has not prevented the Arabs from forcing out ſeveral of them, to ſearch for an imaginary treaſure. The whole column is 114 feet high. It is perfectly well poliſhed, and only a little ſhivered on the eaſtern ſide. Nothing can equal the majeſty of this monument; ſeen from a diſtance, it overtops the town, and ſerves as a ſignal for veſſels. Approaching it nearer, it produces an aſtoniſhment mixed with awe. One can never be tired with admiring the beauty of the capital, the length of the ſhaft, nor the extraordinary ſimplicity of the pedeſtal. This laſt has been ſomewhat damaged by the inſtruments of travellers, who are curious to poſſeſs a relict of this antiquity; and one of the volutes of the column was immaturely brought down about twelve years ago, by a prank of ſome Engliſh captains, which is thus related by Mr Irwin.

Theſe jolly ſons of Neptune had been puſhing about the can on board one of the ſhips in the harbour, until a ſtrange freak entered into one of their brains. The eccentricity of the thought occaſioned it immediately to be adopted; and its apparent impoſſibility was but a ſpur for the putting it into execution. The boat was ordered; and with proper implements for the attempt, theſe enterpriſing heroes puſhed aſhore, to drink a bowl of punch on the top of Pompey's pillar! At the ſpot they arrived; and many contrivances were propoſed to accompliſh the deſired point. But their labour was vain; and they began to deſpair of ſucceſs, when the genius who ſtruck out the frolic happily ſuggeſted the means of performing it. A man was diſpatched to the city for a paper kite. The inhabitants were by this time apprized of what was going forward, and flocked in crowds to be witneſſes of the addreſs and boldneſs of the Engliſh. The governor of Alexandria was told that theſe ſeamen were about to pull down Pompey's pillar. But whether he gave them credit for their reſpect to the Roman warrior, or to the Turkiſh government, he left them to themſelves; and politely anſwered, that the Engliſh were too great patriots to injure the remains of Pompey. He knew little, however, of the diſpoſition of the people who were engaged in this undertaking. Had the Turkiſh empire roſe in oppoſition, it would not perhaps at that moment have deterred them. The kite was brought, and flown ſo directly over the pillar, that when it fell on the other ſide, the ſtring lodged upon the capital. The chief obſtacle was now overcome. A two-inch rope was tied to one end of the ſtring, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the ſeamen aſcended to the top; and in leſs than an hour, a kind of ſhroud was conſtructed, by which the whole company went up, and drank their punch amid the ſhouts of the aſtoniſhed multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our ſeamen found it could contain no leſs than eight perſons very conveniently. It is aſtoniſhing that no accident befel theſe madcaps, in a ſituation ſo elevated, that would have turned a landman giddy in his ſober ſenſes. The only detriment which the pillar received, was the loſs of the volute beforementioned; which came down with a thundering ſound, and was carried to England by one of the captains, as a preſent to a lady who commiſſioned him for a piece of the pillar. The diſcovery which they made amply compenſated for this miſchief; as without their evidence, the world would not have known at this hour, that there was originally a ſtatue on this pillar, one foot and ancle of which are ſtill remaining. The ſtatue muſt have been of a gigantic ſize, to have appeared of a man's proportion at ſo great an height.

Voyage and Route, p. 370.

There are circumſtances in this ſtory which might give it an air of fiction, were it not demonſtrated beyond all doubt. Beſides the teſtimonies of many eye-witneſſes, the adventurers themſelves have left us a token of the fact, by the initials of their names, which are very legible in black paint juſt beneath the capital.

Learned men and travellers have made many fruitleſs attempts to diſcover in honour of what prince it was erected. The beſt informed have concluded that it could not be in honour of Pompey, ſince neither Strabo nor Diodorus Siculus have ſpoken of it. The Arabian Abulfeda, in his deſcription of Egypt, calls it *the Pillar of Severus*. And hiſtory informs us †, that this emperor "viſited the city of Alexandria: That he granted a ſenate to its inhabitants, who until that time, under the ſubjection of a ſingle Roman magiſtrate, had lived without any national council, as under the reign of the Ptolemies, when the will of the prince was their only law: That he did not confine his benefactions there; he changed ſeveral laws in their favour." This column, therefore, Mr Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inſcription,

† *Vide Spartian's Life of Severus*, chap. 17.

tion, now half effaced, but viſible on the weſt ſide when the ſun ſhines upon it, and which probably was legible in the time of Abulfeda, he ſuppoſes the name of Severus to have been preſerved. He further obſerves, that this was not the only monument erected to him by the gratitude of the Alexandrians: for there is ſtill ſeen in the midſt of the ruins of Antinoe, built by Adrian, a magnificent pillar, the inſcription on which is ſtill remaining, dedicated to Alexander Severus.

On the ſouth-weſt ſide of the city, at a mile's diſtance, are ſituated the catacombs, the ancient burial-place of Alexandria; and although they cannot be compared to thoſe of the ancient Memphis, which the Arabs will not permit to be viſited, in order to make the better market of their mummies, it is probable that, the method of embalming being the ſame, the form of theſe catacombs can only differ in their proportions.—The Baron de Tott, in deſcribing theſe, obſerves, "that Nature not having furniſhed this part of Egypt with a ridge of rocks, like that which runs parallel with the Nile above Delta, the ancient inhabitants of Alexandria could only have an imitation by digging into a bed of ſolid rock; and thus they formed Necropolis, or the 'City of the Dead.' The excavation is from 30 to 40 feet wide, and 200 long and 25 deep, and is terminated by gentle declivities at each end. The two ſides, cut perpendicularly, contain ſeveral openings, about 10 or 12 feet in width and height, hollowed horizontally; and which form, by their different branches, ſubterranean ſtreets. One of theſe, which curioſity has diſencumbered from the ruins and ſands that render the entrance of others difficult or impoſſible, contains no mummies, but only the places they occupied. The order in which they were ranged is ſtill to be ſeen. Niches, 20 inches ſquare, ſunk ſix feet horizontally, narrowed at the bottom, and ſeparated from each other by partitions in the rock, ſeven or eight inches thick, divide into checkers the two walls of this ſubterranean vault. It is natural to ſuppoſe, from this diſpoſition, that each mummy was introduced with the feet foremoſt into the cell intended for its reception; and that new ſtreets were opened, in proportion as theſe dead inhabitants of Necropolis increaſed." This obſervation, he adds, which throws a light on the catacombs of Memphis, may perhaps likewiſe explain the vaſt ſize and multitude, as well as the different elevations, of the pyramids in the Higher and Lower Egypt.

About 70 paces from Pompey's pillar is the khalis, or the canal of the Nile, which was dug by the ancient Egyptians, to convey the water of the Nile to Alexandria, and fill the ciſterns under the city. On the ſide of the khalis are gardens full of orange and lemon trees, and the fields are full of caper and palm trees. On the top of a hill is a tower, on which a centinel is always placed, to give notice, by means of a flag, of the ſhips that are coming into the port. From this hill may be ſeen the ſea, the whole extent of the city, and the parts round it.

In going along the ſea-coaſt, there is a large baſon cut out of the rock that lines the ſhore. On the ſides of this baſon, two beautiful ſaloons are hewn out by the chiſſel, with benches that run acroſs them. A canal made zig-zag, for the purpoſe of ſtopping the ſand by its different windings, conveys into them the water of the ſea, as pure and tranſparent as cryſtal. Seated on the ſtone bench, the water riſes a little above the waiſt; while the feet ſoftly repoſe on a fine ſand. The waves of the ſea are heard roaring againſt the rock, and foaming in the canal. The ſwell enters, raiſes you up, and leaves you; and thus alternately entering and retiring, brings a continual freſh ſupply of water, and a coolneſs which is truly delicious under a burning ſky. This place is vulgarly called the *Bath of Cleopatra*. Some ruins announce that it was formerly ornamented.

Alexandria is about 50 leagues north of Cairo. E. Long. 31. 15. N. Lat. 31. 12.

ALEXANDRIA, a ſtrong and conſiderable city of Italy, belonging to the Duchy of Milan, with a good caſtle, built in 1178 in honour of Pope Alexander III. This pope made it a biſhopric, with ſeveral privileges and exemptions. Prince Eugene of Savoy took this city in 1706, after three days ſiege. The French took it in 1745; but the king of Sardinia, to whom it belongs by the treaty of Utrecht, retook it in 1746. The fortifications of the town are trifling, but the citadel is conſiderable. It is 15 miles ſouth-eaſt of Caſſal, 35 north-by-weſt of Genoa, and 40 ſouth-by-weſt of Milan. E. Long. 8. 40. N. Lat. 44. 53. The country about this town is called the *Alexandrin*.

ALEXANDRIA (anc. geog.), a city of Arachoſia, called alſo *Alexandropolis*, on the river Arachotus (Stephanus, Iſidorus Characenus).—Another *Alexandria* in Gedroſia, built by Leonatus, by order of Alexander (Pliny).—A third *Alexandria* in Aria, ſituated at the lake Arias (Ptolemy); but, according to Pliny, built by Alexander on the river Arius.—A fourth in the Bactriana (Pliny).—A fifth *Alexandria*, an inland town of Carmania (Pliny, Ptolemy, Ammian).—A ſixth *Alexandria*, or *Alexandropolis*, in the Sogdiana (Iſidorus Characenus).—A ſeventh in India, at the confluence of the Aceſines and Indus (Arrian).—An eighth, called alſo *Alexandretta*, near the Sinus Iſſicus, on the confines of Syria and Cilicia, now *Scanderoon* (ſee ALEXANDRETTA), the port-town to Aleppo.—A ninth *Alexandria* of Margiana, which being demoliſhed by the barbarians, was rebuilt by Antiochus the ſon of Seleucus, and called *Antiochia* of Syria (Pliny); watered by the river Margus, which is divided into ſeveral channels, for the purpoſe of watering the country, which was called *Zotale*. The city was ſeventy ſtadia in circuit, according to Pliny; who adds, that, after the defeat of Craſſus, the captives were conveyed to this place by Orodes, the king of the Parthians.—A tenth, of the Oxiana, built on the Oxus by Alexander, on the confines of Bactria (Pliny).—An eleventh, built by Alexander at the foot of mount Paropamiſus, which was called *Caucaſus* (Pliny, Arrian).—A twelfth *Alexandria* in Troas, called alſo *Troas* and *Antigonia* (Pliny).—A thirteenth on the Iaxartes, the boundary of Alexander's victories towards Scythia, and the laſt that he built on that ſide.

ALEXANDRIAN, in a particular ſenſe, is applied to all thoſe who profeſſed or taught the ſciences in the ſchool of Alexandria. In this ſenſe, Clemens is denominated *Alexandrinus*, though born at Athens. The ſame may be ſaid of Apion, who was born at Oaſis; and Aroſtarchus, by birth a Samothracian. The chief Alexandrian philoſophers were, Amonius, Plotinus,

tinus, Origen, Porphyry, Jamblicus, Sopater, Maximus, and Dexippus.

Alexandrian is more particularly underſtood of a college of prieſts, conſecrated to the ſervice of Alexander Severus after his deification. Lampridius relates, that, notwithſtanding Severus was killed by Maximin, the ſenate proſecuted his apotheoſis; and, for regularity of worſhip, founded an order of prieſts, or *ſodales*, under the denomination of *Alexandrini*.

***Alexandrian** Library.* See p. 389, *ſupra.*

***Alexandrian** Manuſcript*, a famous copy of the Scriptures, conſiſting of four volumes, in a large quarto ſize; which contains the whole Bible in Greek, including the Old and New Teſtament, with the Apocrypha, and ſome ſmaller pieces, but not quite complete. This manuſcript is now preſerved in the Britiſh Muſeum. It was ſent as a preſent to King Charles I. from Cyrillus Lucaris, patriarch of Conſtantinople, by Sir Thomas Rowe, ambaſſador from England to the Grand Signior, about the year 1628. Cyrillus brought it with him from Alexandria, where probably it was written. In a ſchedule annexed to it, he gives this account: That it was written, as tradition informed them, by Thecla, a noble Egyptian lady, about 1300 years ago, not long after the council of Nice. But this high antiquity, and the authority of the tradition to which the patriarch refers, have been diſputed; nor are the moſt accurate biblical writers agreed about its age. Grabe thinks that it might have been written before the end of the fourth century; others are of opinion, that it was not writ till near the end of the fifth century, or ſomewhat later.

Alexandrian, or *Alexandrine*, in poetry, a kind of verſes conſiſting of twelve, or of twelve and thirteen ſyllables alternately; ſo called from a poem on the life of Alexander, written in this kind of verſe by ſome French poet. Alexandrines are peculiar to modern poetry, and ſeem well adapted to epic poems. They are ſometimes uſed by moſt nations of Europe; but chiefly by the French, whoſe tragedies are generally compoſed of Alexandrines.

ALEXICACUS, ſomething that preſerves the body from harm or miſchief. The word amounts to much the ſame as *alexiterial.*

Alexicacus, in antiquity, was an attribute of Neptune, whom the tunny-fiſhers uſed to invoke under this appellation, that their nets might be preſerved from the ξιφιας, or ſword-fiſh, which uſed to tear them; and that he might prevent the aſſiſtance which it was pretended the dolphins uſed to give the tunnies on this occaſion.

ALEXIPHARMICS, in medicine, are properly remedies for expelling or preventing the ill effects of poiſon: but ſome of the moderns having imagined, that the animal ſpirits, in acute diſtempers, were affected by a malignant poiſon, the term has been underſtood to mean medicines adapted to expel this poiſon by the cutaneous pores, in the form of ſweat. In this ſenſe, alexipharmics are the ſame as ſudorifics.

ALEXIS, a Piedmonteſe. There is a book of "Secrets," which for a long time has gone under his name. It was printed at Baſil 1536, in 8vo, and tranſlated from Italian into Latin by Wecher; it has alſo been tranſlated into French, and printed ſeveral times with additions. There is a preface to the piece, wherein Alexis informs us, that he was born of a noble family; that he had from his moſt early years applied himſelf to ſtudy; that he had learned the Greek, the Latin, the Hebrew, the Chaldean, the Arabian, and ſeveral other languages; that having an extreme curioſity to be acquainted with the ſecrets of nature, he had collected as much as he could during his travels for 57 years: that he piqued himſelf upon not communicating his ſecrets to any perſon; but that when he was 82 years of age, having ſeen a poor man who had died of a ſickneſs which might have been cured had he communicated his ſecret to the ſurgeon who took care of him, he was touched with ſuch a remorſe of conſcience, that he lived almoſt like a hermit: and it was in this ſolitude that he ranged his ſecrets in ſuch an order as to make them fit to be publiſhed. The hawkers generally carry them, with other books, to the country fairs. Theſe, however, contain only the ſelect remedies of Seignor Alexis of Piedmont; the entire collection would make too large a volume for them.

ALEXITERIAL, among phyſicians, a term of much the ſame import with *alexipharmic;* though ſometimes uſed in a ſynonymous ſenſe with amulet.

ALEYN (Charles), an Engliſh poet in the reign of Charles I. In 1631, he publiſhed two poems on the famous victories of Creſſy and Poictiers. He ſucceeded his father as clerk of the ordnance, and was commiſſary general of the artillery to the king at the battle of Edgehill. The next piece he wrote was a poem in honour of Henry VII. and the victory that gained him the crown of England. In 1639, the year before he died, he tranſlated the hiſtory of Eurialius and Lucretia, from the Latin epiſtles of Æneas Sylvius.

ALFANDIGA, the name of the cuſtom-houſe at Liſbon.

ALFAQUES, among the Moors, the name generally uſed for their clergy, or thoſe who teach the Mahometan religion; in oppoſition to the Morabites, who anſwer to monks among Chriſtians.

ALFATERNA (anc. geog.), the laſt town of Campania, beyond Veſuvius (Diodorus); the ſame with *Nocera*, which ſee. The inhabitants *Alfaterni* (Pliny).

ALFDOUCH, a name given by the Moors to a ſort of vermicelli, which they make of flour and water, and are very fond of in their entertainments.

ALFET, in old cuſtoms, denotes a caldron full of boiling water, wherein an accuſed perſon, by way of trial or purgation, plunged his arm up to the elbow.

ALFORD, a town in Lincolnſhire, with a market on Tueſdays for proviſions and corn; and two fairs, on Whit-Tueſday, and November 8. for cattle and ſheep. It is ſeated on a ſmall brook that runs through the town, and is a compact place. A ſalt ſpring was diſcovered here in 1670, from the pigeons which flew thither in great numbers to drink the water; thoſe birds being known to be fond of ſalt. It contains a purging ſalt, together with a portion of ſea-ſalt. It is ſtrongly purgative. It is recommended as cooling, cleanſing, and attenuating. As a good remedy in the ſcurvy, jaundice, and other glandular obſtructions. It alſo promotes urine and ſweat, and therefore is good in gravelly and other diſorders of the kidneys and bladder; and in complaints ariſing from obſtructed perſpiration. Alford is ſix miles from the ſea, and 20 N. of Boſton. E. Long. 0. 15. N. Lat. 53. 30.

ALFRED, or ÆLFRED, the Great, king of England, was the fifth and youngeſt ſon of Æthelwolf king of the Weſt Saxons, and was born at Wantage in Berkſhire in 849. He diſtinguiſhed himſelf during the reign of his brother Ethelred, in ſeveral engagements againſt the Danes; and upon his death ſucceeded to the crown, in the year 871, and the 22d of his age. At his aſcending the throne he found himſelf involved in a dangerous war with the Danes, and placed in ſuch circumſtances of diſtreſs as called for the greateſt valour, reſolution, and all the other virtues with which he was adorned. The Danes had already penetrated into the heart of his kingdom; and before he had been a month upon the throne, he was obliged to take the field againſt thoſe formidable enemies. After many battles gained on both ſides, he was at length reduced to the greateſt diſtreſs, and was entirely abandoned by his ſubjects. In this ſituation, Alfred, conceiving himſelf no longer a king, laid aſide all marks of royalty, and took ſhelter in the houſe of one who kept his cattle. He retired afterwards to the iſle of Æthelingey in Somerſetſhire, where he built a fort for the ſecurity of himſelf, his family, and the few faithful ſervants who repaired thither to him. When he had been about a year in this retreat, having been informed that ſome of his ſubjects had routed a great army of the Danes, killed their chiefs, and taken their magical ſtandard (A), he iſſued his letters, giving notice where he was, and inviting his nobility to come and conſult with him. Before they came to a final determination, Alfred, putting on the habit of a harper, went into the enemy's camp, where, without ſuſpicion, he was every where admitted, and had the honour to play before their princes. Having thereby acquired an exact knowledge of their ſituation, he returned in great ſecrecy to his nobility, whom he ordered to their reſpective homes, there to draw together each man as great a force as he could; and upon a day appointed there was to be a general rendezvous at the great wood, called *Selwood*, in Wiltſhire. This affair was tranſacted ſo ſecretly and expeditiouſly, that, in a little time, the king, at the head of an army, approached the Danes, before they had the leaſt intelligence of his deſign. Alfred, taking advantage of the ſurpriſe and terror they were in, fell upon them, and totally defeated them at Æthendune, now Eddington. Thoſe who eſcaped fled to a neighbouring caſtle, where they were ſoon beſieged, and obliged to ſurrender at diſcretion. Alfred granted them better terms than they could expect. He agreed to give up the whole kingdom of the Eaſt-Angles to ſuch as would embrace the Chriſtian religion, on condition they would oblige the reſt of their countrymen to quit the iſland, and, as much as it was in their power, prevent the landing of any more foreigners. For the performance thereof he took hoſtages; and when, in purſuance of the treaty, Guthrum the Daniſh captain came, with thirty of his chief officers, to be baptized, Alfred anſwered for him at the font, and gave him the name of *Æthelſtane*; and certain laws were drawn up between the king and Guthrum for the regulation and government of the Danes ſettled in England. In 884, a freſh number of Danes landed in Kent, and laid ſiege to Rocheſter; but the king coming to the relief of that city, they were obliged to abandon their deſign. Alfred had now great ſucceſs; which was chiefly owing to his fleet, an advantage of his own creating. Having ſecured the ſea-coaſts, he fortified the reſt of the kingdom with caſtles and walled towns; and he beſieged and recovered from the Danes the city of London, which he reſolved to repair, and keep as a frontier (B).

After ſome years reſpite, Alfred was again called into the field: for a body of Danes, being worſted in the weſt of France, came with a fleet of 250 ſail on the coaſt of Kent; and having landed, fixed themſelves at Apple-tree: ſhortly after, another fleet of 80 veſſels coming up the Thames, the men landed, and built a fort at Middleton. Before Alfred marched againſt the enemy, he obliged the Danes, ſettled in Northumberland and Eſſex, to give him hoſtages for their good behaviour. He then moved towards the invaders, and pitched his camp between their armies, to prevent their junction. A great body, however, moved off to Eſſex; and croſſing the river, came to Farnham in Surry, where they were defeated by the king's forces. Mean while the Danes ſettled in Northumberland, in breach of treaty, and notwithſtanding the hoſtages given, equipped two fleets; and, after plundering the northern and ſouthern coaſts, ſailed to Exeter, and beſieged it. The king, as ſoon as he received intelligence, marched againſt them; but before he reached Exeter, they had got poſſeſſion of it. He kept them, however, blocked up on all ſides; and reduced them at laſt to ſuch extremities, that they were obliged to eat their horſes, and were even ready to devour each other. Being at length rendered deſperate, they made a general ſally on the beſiegers;

(A) "This (ſays Sir John Spelman) was a banner with the image of a raven magically wrought by the three ſiſters of Hinguar and Hobba, on purpoſe for their expedition, in revenge of their father Lodebroch's murder, made, ſay they, almoſt in an inſtant, being by them at once begun and finiſhed in a noontide, and believed by the Danes to have carried great fatality with it, for which it was highly eſteemed by them. It is pretended, that being carried in battle, towards good ſucceſs it would always ſeem to clap its wings, and make as if it would fly; but towards the approach of miſhap, it would hang down and not move." *Life of Alfred*, p. 61.

(B) The Danes had poſſeſſed themſelves of London in the time of his father; and had held it till now as a convenient place for them to land at, and fortify themſelves in; neither was it taken from them but by a cloſe ſiege. However, when it came into the king's hands, it was in a miſerable condition, ſcarce habitable, and all its fortifications ruined. The king, moved by the importance of the place, and the deſire of ſtrengthening his frontier againſt the Danes, reſtored it to its ancient ſplendor. And obſerving, that, through the confuſion of the times, many, both Saxons and Danes, lived in a looſe diſorderly manner, without owning any government, he offered them now a comfortable eſtabliſhment, if they would ſubmit and become his ſubjects. This propoſition was better received than he expected; for multitudes growing weary of a vagabond kind of life, joyfully accepted ſuch an offer. *Chron. Sax.* p. 88.

ſiegers; but were defeated, though with great loſs on the king's ſide. The remainder of this body of Danes fled to Eſſex, into the fort they had built there, and to their ſhips. Before Alfred had time to recruit himſelf, another Daniſh leader, whoſe name was Laf, came with a great army out of Northumberland, and deſtroyed all before him, marching on to the city of Werheal in the weſt, which is ſuppoſed to be Cheſter, where they remained the reſt of that year. The year following they invaded North-Wales; and after having plundered and deſtroyed every thing, they divided, one body returning to Northumberland, another into the territories of the Eaſt-Angles; from whence they proceeded to Eſſex, and took poſſeſſion of a ſmall iſland called *Mereſig*. Here they did not long remain: for having parted, ſome ſailed up the river Thames, and others up the Lea-road; where drawing up their ſhips, they built a fort not far from London, which proved a great check upon the citizens, who went in a body and attacked it, but were repulſed with great loſs: at harveſt-time the king himſelf was obliged to encamp with a body of troops in the neighbourhood of the city, in order to cover the reapers from the excurſions of the Danes. As he was one day riding by the ſide of the river Lea, after ſome obſervations, he began to think that the Daniſh ſhips might be laid quite dry: this he attempted, and ſucceeded; ſo that the Danes deſerted their fort and ſhips, and marched away to the banks of the Severn, where they built a fort, and wintered at a place called *Quatbrig* (c). Such of the Daniſh ſhips as could be got off, the Londoners carried into their own road; the reſt they burnt and deſtroyed.

Alfred enjoyed a profound peace during the three laſt years of his reign, which he chiefly employed in eſtabliſhing and regulating his government, for the ſecurity of himſelf and his ſucceſſors, as well as the eaſe and benefit of his ſubjects in general. After a troubleſome reign of 28 years, he died on the 28th of October A. D. 900; and was buried at Wincheſter, in Hyde-abbey, under a monument of porphyry.

All the hiſtorians agree in diſtinguiſhing him as one of the moſt valiant, wiſeſt, and beſt of kings that ever reigned in England; and it is alſo generally allowed, that he not only digeſted ſeveral particular laws ſtill in being, but that he laid the firſt foundation of their preſent happy conſtitution. There is great reaſon to believe that they are indebted to this prince for trials by juries; and the doomſday book, which is preſerved in the exchequer, is thought to be no more than another edition of Alfred's book of Wincheſter, which contained a ſurvey of the kingdom. It is ſaid alſo, that he was the firſt who divided the kingdom into ſhires: what is aſcribed to him is not a bare diviſion of the country, but the ſettling a new form of judicature; for after having divided his dominions into ſhires, he ſubdivided each ſhire into three parts, called *trythings*. There are ſome remains of this ancient diviſion in the ridings of Yorkſhire, the laths of Kent, and the three parts of Lincolnſhire. Each trything was divided into hundreds or wapentakes; and theſe again into tythings or dwellings of ten houſeholders: each of theſe houſeholders ſtood engaged to the king, as a pledge for the good behaviour of his family, and all the ten were mutually pledges for each other; ſo that if any one of the tything was ſuſpected of an offence, if the head boroughs or chiefs of the tything would not be ſecurity for him, he was impriſoned; and if he made his eſcape, the tything and hundred were fined to the king. Each ſhire was under the government of an earl, under whom was the reive, his deputy; ſince, from his office, called *ſhire-reive*, or *ſheriff*. And ſo effectual were theſe regulations, that it is ſaid he cauſed bracelets of gold to be hung up in the high ways, as a challenge to robbers, and they remained untouched.

In private life, Alfred was the moſt amiable man in his dominions; of ſo equal a temper, that he never ſuffered either ſadneſs or unbecoming gaiety to enter his mind; but appeared always of a calm, yet cheerful diſpoſition, familiar to his friends, juſt even to his enemies, kind and tender to all. He was a remarkable œconomiſt of his time, and Aſſerius has given us an account of the method he took for dividing and keeping an account of it; he cauſed ſix wax-candles to be made, each 12 inches long, and of as many ounces weight; on the candles the inches were regularly marked, and having found that one of them burnt juſt four hours, he committed them to the care of the keepers of his chapel, who from time to time gave him notice how the hours went: but as in windy weather the candles were waſted by the impreſſion of the air on the flame, to remedy this inconvenience, he invented lanthorns, there being then no glaſs in his dominions.

This prince, we are told, was twelve years of age before a maſter could be procured in the weſtern kingdom to teach him the alphabet; ſuch was the ſtate of learning when Alfred began to reign. He had felt the miſery of ignorance; and determined even to rival his cotemporary Charlemagne in the encouragement of literature. He is ſuppoſed to have appointed perſons to read lectures at Oxford, and is thence conſidered as the founder of that univerſity. By other proper eſtabliſhments, and by a general encouragement to men of abilities, he did every thing in his power to diffuſe knowledge throughout his dominions. Nor was this end promoted more by his countenance and encouragement than by his own example and writings. For notwithſtanding the lateneſs of his initiation, he had acquired extraordinary erudition; and, had he not been illuſtrious as a king, he would have been famous as an author. His works are, 1. *Breviarum quoddam collectum ex Legibus Trojanorum*, &c. lib. I. A Breviary collected out of the Laws of the Trojans, Greeks, Britons, Saxons and Danes, in one Book. Leland ſaw this book in the Saxon tongue, at Chriſt-Church in Hampſhire. 2, *Viſi-Saxonum Leges*, lib. I. The laws of the Weſt-Saxons, in one book. Pitts tells us, that it is in Bennet-net College library, at Cambridge. 3. *Inſtituta quædam,* lib. I. Certain Inſtitutes, in one book. This is mentioned by Pitts, and it ſeems to be the ſecond capitulation with Guthrum. 4. *Contra judices iniquos,* lib. I. An Invective againſt Unjuſt Judges, in one book. 5. *Acta Magiſtratuum ſuorum,* lib. I. Acts of his Magiſtrates, in one book. This is ſuppoſed to be the book of judgments mentioned by Horne; and was, in all probability, a kind of reports, intended for the uſe of ſucceeding ages. 6. *Regum fortunæ variæ,* lib. I. The various Fortunes of Kings, in one book. 7. *Dicta ſapientum,* lib. I. The Sayings of Wiſe Men, in one book. 8. *Parobolæ et ſales,* lib. I. Parables and pleaſant Sayings, in one book. 9. *Collectiones chronicorum.* Collections of Chronicles. 10. *Epiſtolæ ad Wulfſigium Epiſcopum,* lib. I. Epiſtles to Biſhop Wulfsig, in one book. 11. *Manuale meditationum.* A Manual of Meditations.—Beſides theſe original works, he tranſlated many authors from the Latin, &c. into the Saxon language, *viz.* 1. Bede's Hiſtory of England, 2. Paulinus Oroſinus's Hiſtory of the Pagans. 3. St Gregory's Paſtoral, *&c.* The firſt of theſe, with his prefaces to the others, together with his laws, were printed at Cambridge, 1644. His laws are likewiſe inſerted in Spelman's Councils. 4. *Boethius de Conſolatione,* lib. V. Boetius's Conſolations of Philoſophy, in five books. Dr Plot tells us, king Alfred tranſlated it at Woodſtock, as he found in a MS. in the Cotton Library. 5. *Æſopi fabulæ,* Æſop's Fables; which he is ſaid to have tranſlated from the Greek both into Latin and Saxon. 6. *Pſalterium Davidicum,* lib. I. David's Pſalter in one book. This was the laſt work the King attempted, death ſurpriſing him before he had finiſhed it; it was completed however by another hand, and publiſhed at London in 1640, in quarto, by Sir John Spelman. Several others are mentioned by Malmſbury; and the old hiſtory of Ely aſſerts, that he tranſlated the Old and New Teſtaments.

(c) The king's contrivance is thought to have produced the meadow between Hertford and Bow; for at Hertford was the Daniſh fort, and from thence they made frequent excurſions on the inhabitants of London. Authors are not agreed as to the method the king purſued in laying dry the Daniſh ſhips: Dugdale ſuppoſes that he did it by ſtraitening the channel; but Henry of Huntingdon alleges, that he cut ſeveral canals, which exhauſted its water.

The life of this great king was firſt written by Aſſerius Menevenſis; and firſt publiſhed by Archbiſhop Parker, in the old Saxon character, at the end of his edition of Haſſingham's hiſtory, printed in 1674, fol.

ALGA, in botany, the trivial name of the lichen, fucus, and ſeveral other plants of the cryptogamia claſs.

ALGÆ, FLAGS; one of the ſeven families or natural tribes into which the whole vegetable kingdom is divided by Linnæus, in his *Philoſophia Botanica.* They are defined to be plants, whoſe root, leaf, and ſtem are all one. Under this deſcription are comprehended all the ſea-weeds, and ſome other aquatic plants. In the ſexual ſyſtem, they conſtitute the 3d order of the 24th claſs *Cryptogamia;* in Tournefort, the ſecond genus of the ſecond ſection, *Marinæ, aut fluviatiles,* of the 17th claſs, *Aſpermæ vulgo habitæ;* and the 57th order in Linnæus's Fragments of a Natural Method. The diſcoveries made in this part of the vegetable kingdom are uncertain, and imperfect; and the attempts, in particular, to arrange flags by the parts of the fructification, have not been attended with great ſucceſs. Dillenius has arranged this order of plants from their general habit and ſtructure; Michelius from the parts of fructification.—Each has conſiderable merit.

ALGAGIOLA, a ſmall ſea-port town in the iſland of Corſica, fortified with walls and baſtions. It was almoſt deſtroyed by the malcontents in 1731, but has ſince been repaired. E. Long 9. 45. N. Lat. 42. 20.

ALGAROT, in chemiſtry, an Arabic term for an emetic powder, prepared from regulus of antimony, diſſolved in acids, and ſeparated by repeated lotions in warm water.

ALGAROTTI (Count), a celebrated Italian, was born at Padua; but the year is not mentioned. Led by curioſity, as well as a deſire of improvement, he travelled early into foreign countries; and was very young when he arrived in France in 1736. Here he compoſed his "Newtonian Philoſophy for the Ladies;" as Fontenelle had done his Carteſian Aſtronomy, in the work intitled, "the Plurality of worlds." He was noticed by the king of Pruſſia, who gave him marks of the eſteem he had for him. He died at Piſa the 23d of May, 1764; and ordered his own mauſoleum, with this inſcription to be fixed upon it: "Hic jacet Algarottus, ſed non omnis." He is allowed to have been a very great connoiſſeur in painting, ſculpture, and architecture. He contributed much to the reformation of the Italian opera. His works, which are numerous, and upon a variety of ſubjects, abound with vivacity, elegance, and wit: a collection of them has lately been made, and printed at Leghorn.

ALGARVA, a province in the kingdom of Portugal, 67 miles in length and 20 in breadth; bounded on the W. and S. by the ſea, on the E. by the river Gaudiana, and on the N. by Alenteja. It is very fertile in figs, almonds, dates, olives, and excellent wines; beſides, the fiſhery brings in large ſums. The capital town is Pharo. It contains four cities, 12 towns, 67 pariſhes, and 61,000 inhabitants.

ALGEBRA,

Definition and etymology.

A GENERAL method of computation, wherein ſigns, and ſymbols, commonly the letters of the alphabet, are made uſe of to repreſent numbers, or any other quantities.

This ſcience, properly ſpeaking, is no other than a kind of ſhort-hand, or ready way of writing down a chain of mathematical reaſoning on any ſubject whatever; ſo that it is applicable to arithmetic, geometry, aſtronomy, menſuration, and all kinds of ſolids, &c. and the great advantages derived from it appear manifeſtly to ariſe from the conciſeneſs and perſpicuity with which every propoſition on mathematical ſubjects can be written down in algebraic characters, greatly ſuperior to the tedious circumlocutions which would be neceſſary were the reaſoning to be written in words at length.

With regard to the etymology of the word *algebra* it is much conteſted by the critics. Menage derives it from the Arabic *algiabarat,* which ſignifies the reſtitution of any thing broken; ſuppoſing that the principal part of algebra is the conſideration of broken numbers. Others rather borrow it from the Spaniſh, *algebriſta,* a perſon who replaces diſlocated bones; adding, that algebra has nothing to do with fraction. Some, with M. d'Herbelot, are of opinion, that algebra takes its name from Gebar, a celebrated philoſopher, chemiſt, and mathematician, whom the Arabs call Giaber, and who is ſuppoſed to have been the inventor. Others from *gefr*, a kind of parchment made of the ſkin of a camel, whereon Ali and Giafer Sadek wrote, in myſtic characters, the fate of Mahometaniſm, and the grand events that were to happen till the end of the world. But others, with more probability, derive it from *geber;* a word whence, by prefixing the article *al*, we have formed *algebra;* which is pure Arabic, and properly ſignifies the reduction of fractions to a whole number. However, the Arabs, it is to be obſerved, never uſe the word *algebra* alone, to expreſs what we mean by it; but always add to it the word *macabelah*, which ſignifies oppoſition and compariſon: thus *algebra al-macabelah*, is what we properly call *algebra*.

Some authors define algebra, The art of ſolving mathematical problems; but this is rather the idea of analyſis, or the analytic art. The Arabs call it, *The art of reſtitution and compariſon:* or, *The art of reſolution and equation.* Lucas de Burgo, the firſt European who wrote of algebra, calls it *Regula rei et cenſus;* that is, the rule of the root and its ſquare; the root with them being called *res*, and the ſquare *cenſus*. Others call it *Specious Arithmetic;* and ſome, *Univerſal Arithmetic*.

HISTORY. It is highly probable that the Indians or Arabians firſt invented this noble art: for it may be reaſonably ſuppoſed, that the ancient Greeks were ignorant of it; becauſe Pappus, in his mathematical collections, where he enumerates their analyſis, makes no mention of any thing like it; and, beſides, ſpeaks of a local problem, begun by Euclid, and continued by Apollonius, which none of them could fully reſolve; which doubtleſs they might eaſily have done, had they known any thing of algebra.

Diaphantus was the firſt Greek writer of algebra; who publiſhed 13 books about the year 800, though only ſix of them were tranſlated into Latin, by Xylander, in 1575; and afterwards, viz. *anno* 1621, into Greek and Latin, by M. Buchet and Fermat, with additions of their own. This algebra of Diaphantus's only extends to the ſolution of arithmetical indeterminate problems.

Before this tranſlation of Diaphantus came out, Lucas Pacciolus, or Lucas de Burgo, a Minorite friar, publiſhed at Venice, in the year 1494, an Italian treatiſe of algebra. This author makes mention of Leonardus Piſanus, and ſome others, of whom he had learned the art; but we have none of their writings. He adds, that algebra came originally from the Arabs, and never mentions Diaphantus; which makes it probable that that author was not then known in Europe. His algebra goes no farther than ſimple and quadratic equations.

After Pacciolus appeared Stifelius, a good author; but neither did he advance any farther.

After him came Scipio Ferreus, Cardan, Tartagilla, and ſome others, who reached as far as the ſolution of ſome cubic equations. Bombelli followed thoſe, and went a little farther. At laſt came Nunnius, Ramus, Schoner, Salignac, Clavius, &c. who all of them took different courſes, but none of them went beyond quadratics.

In 1590, Vieta introduced what he called his *Specious Arithmetic*, which conſiſts in denoting the quantities, both known and unknown, by ſymbols or letters. He alſo introduced an ingenious method of extracting the roots of equations, by approximations; ſince greatly improved and facilitated by Ralphſon, Halley, Maclaurin, Simpſon, and others.

Vieta was followed by Oughtred, who, in his *Clavis Mathematica*, printed in 1631, improved Vieta's method, and invented ſeveral compendious characters, to ſhow the ſums, differences, rectangles, ſquares, cubes, &c.

Harriot, another Engliſhman, cotemporary with Oughtred, left ſeveral treatiſes at his death; and, among the reſt, an Analyſis, or Algebra, which was printed in 1631, where Vieta's method is brought into a ſtill more commodious form, and is much eſteemed to this day.

In 1657, Des Cartes publiſhed his geometry, wherein he made uſe of the literal calculus and the algebraic rules of Harriot; and as Oughtred in his Clavis, and Marin. Ghetaldus in his books of mathematical compoſition and reſolution publiſhed in 1630, applied Vieta's arithmetic to elementary geometry, and gave the conſtruction of ſimple and quadratic equations; ſo Des Cartes applied Harriot's Method to the higher geometry, explaining the nature of curves by equations, and adding the conſtructions of cubic, biquadratic, and other higher equations.

Des Cartes's rule for conſtructing cubic and biquadratic equations, was farther improved by Thomas Baker, in his *Clavis Geometrica Catholica*, publiſhed in 1684; and the foundation of ſuch conſtructions, with the application of algebra to the quadratures of curves, queſtions *de maximis et minimis*, the centrobaryc method of Guldinus, &c. was given by R. Sluſius, in 1668; as alſo by Fermat in his *Opera Mathematica*, Roberval in the *Mem. de Mathem. et de Phyſique*, and Barrow in his *Lect. Geomet.* In 1708, algebra was applied to the laws of chance and gaming, by R. de Montmort; and ſince by de Moivre and James Bernouilli.

The elements of the art were compiled and publiſhed by Kerſey, in 1671; wherein the ſpecious arithmetic, and the nature of equations, are largely explained, and illuſtrated by a variety of examples: the whole ſubſtance of Diaphantus is here delivered, and many things added concerning mathematical compoſition and reſolution from Ghetaldus. The like has been ſince done by Preſtet in 1694, and by Ozanam in 1703: but theſe authors omit the application of algebra to geometry; which defect is ſupplied by Guiſnec in a French treatiſe expreſsly on the ſubject publiſhed in 1704, and l'Hopital in his analytical treatiſe of the conic ſections in 1707. The rules of algebra are alſo compendiouſly delivered by Sir Iſaac Newton, in his *Arithmetica Univerſalis*, firſt publiſhed in 1707, which abounds in ſelect examples, and contains ſeveral rules and methods invented by the author.

Algebra has alſo been applied to the conſideration and calculus of infinites; from whence a new and extenſive branch of knowledge has ariſen, called the *Doctrine of Fluxions*, or *Analyſis of Infinites*, or the *Calculus Differentialis*.

PART I.

INTRODUCTION.

Introduction.

A QUANTITY which can be meaſured, and is the object of mathematics, is of two kinds, *Number* and *Extenſion*. The former is treated of in *Arithmetic*; the latter in *Geometry*.

Numbers are ranged in a ſcale, by the continued repetition of ſome one number, which is called the *Root*; and, in conſequence of this order, they are conveniently expreſſed in words, and denoted by characters. The operations of arithmetic are eaſily derived from the eſtabliſhed method of notation, and the moſt ſimple reaſonings concerning the relations of magnitude.

Inveſtigations by the common arithmetic are greatly limited, from the want of characters to expreſs the quantities that are unknown, and their different relations to one another, and to ſuch as are known. Hence letters and other convenient ſymbols have been introduced to ſupply this defect; and thus gradually has ariſen the ſcience of *Algebra*, properly called *Univerſal Arithmetic*.

In the common arithmetic too, the given numbers diſappear in the courſe of the operation, ſo that general rules can ſeldom be derived from it; but, in algebra, the known quantities, as well as the unknown, may be expreſſed by letters, which, through the whole operation, retain their original form; and hence may be deduced, not only general canons for like caſes, but the dependence of the ſeveral quantities concerned, and likewiſe the determination of a problem, without exhibiting which, it is not completely reſolved. This general manner of expreſſing quantities alſo, and the general reaſonings concerning their connections, which may be founded on it, have rendered this ſcience not leſs uſeful in the demonſtration of theorems than in the reſolution of problems.

If geometrical quantities be ſuppoſed to be divided into equal parts, their relations, in reſpect of magnitude, or their proportions, may be expreſſed by numbers; one of theſe equal parts being denoted by the unit. Arithmetic, however, is uſed in expreſſing only the concluſions of geometrical propoſitions; and it is by algebra that the bounds and application of geometry have been of late ſo far extended.

The proper objects of mathematical ſcience are number and extenſion; but mathematical inquiries may be inſtituted alſo concerning any phyſical quantities that are capable of being meaſured or expreſſed by numbers and extended magnitudes: And, as the application of algebra may be equally univerſal, it has been called *The ſcience of quantity in general.*

DEFINITIONS.

Definitions.

1. QUANTITIES which are known are generally repreſented by the firſt letters of the alphabet, as a, b, c, &c. and ſuch as are unknown by the laſt letters, as x, y, z, &c.
2. The ſign $+$ (*plus*) denotes, that the quantity before which it is placed is to be added. Thus $a+b$ denotes the ſum of a and b; $3+5$ denotes the ſum of 3 and 5, or 8. When no ſign is expreſſed, $+$ is underſtood.
3. The ſign $-$ (*minus*) denotes, that the quantity before which it is placed is to be ſubtracted. Thus $a-b$ denotes the exceſs of a above b; $6-2$ is the exceſs of 6 above 2, or 4. *Note*, Theſe characters $+$ and $-$, from their extenſive uſe in algebra, are called *the ſigns*; and the one is ſaid to be *oppoſite* or *contrary* to the other.
4. Quantities which have the ſign $+$ prefixed to them are called *poſitive* or *affirmative*; and ſuch as have the ſign $-$ prefixed to them are called *negative*.
5. Quantities which have the ſame ſign, either $+$ or $-$, are alſo ſaid to have *like ſigns*, and thoſe which have different ſigns are ſaid to have *unlike ſigns*. Thus $+a, +b$, have like ſigns, and $+a, -c$, are ſaid to have unlike ſigns.
6. The *juxtapoſition* of letters as in the ſame word, expreſſes the product of the quantities denoted by theſe letters. Thus ab expreſſes the product of a and b; bcd expreſſes the continued product of b, c, and d. The ſign $\times$ alſo expreſſes the product of any two quantities between which it is placed.
7. A number prefixed to a letter is called a *numerable coefficient*, and expreſſes the product of the quantity by that number, or how often the quantity denoted by the letter is to be taken. When no number is prefixed, unit is underſtood.
8. The *quotient* of two quantities is denoted by placing the *dividend* above a ſmall line and the *diviſor* below it. Thus $\frac{18}{3}$ is the quotient of 18 divided by 3, or 6; $\frac{a}{b}$ is the quotient of a divided by b. This expreſſion of a quotient is alſo called a *fraction*.
9. A quantity is ſaid to be *ſimple*, which conſiſts of one part or *Term*, as $+a, -abc$; and a quantity is ſaid to be *compound*, when it conſiſts of more than one term, connected by the ſigns $+$ or $-$. Thus $a+b$, $a-b+c$, are compound quantities. If there are two terms, it is called a *binomial*; if three, a *trinomial*, &c.
10. Simple quantities, or the terms of compound quantities, are ſaid to be *like*, which conſiſt of the ſame letter or letters, equally repeated. Thus $+ab$, $-5ab$, are like quantities; but $+ab$, and $+aab$, are unlike.
11. The equality of two quantities is expreſſed, by placing the ſign $=$ between them. Thus $x+a=b-c$, means that the ſum of x and a is equal to the exceſs of b above c.

When quantities are conſidered abſtractly, then $+$ and $-$ denote addition and ſubtraction only, according to Def. 2. and 3. and the terms *poſitive* and *negative* expreſs the ſame ideas. In that caſe, a negative quantity by itſelf is unintelligible. The ſign $+$ alſo is unneceſſary before ſimple quantities, or before the leading term of a compound quantity which is not negative; though, when ſuch a quantity or term is to be added to another, $+$ muſt be placed before it, to expreſs that addition; and hence in Def. 2. it is ſaid, that $+$ is underſtood when no ſign is expreſſed.

In geometry, however, and in certain applications of

Fundamental operations.

of geometry and algebra, there may be an oppoſition or contrariety in the quantities, analogous to that of addition and ſubtraction; and the ſigns + and — may very conveniently be uſed to expreſs that contrariety. In ſuch caſes, negative quantities are underſtood to exiſt by themſelves; and the ſame rules take place in operations into which they enter, as are uſed with regard to the negative terms of abſtract quantities.

CHAP. I.

Sect. 1. *Fundamental Operations.*

The fundamental operations in algebra are the ſame as in common arithmetic, *Addition, Subtraction, Multiplication*, and *Diviſion;* and from the various combinations of theſe four all the others are derived.

Prob. I. *To add Quantities.*

Simple quantities, or the terms of compound quantities to be added together, may be *like with like ſigns, like with unlike ſigns*, or they may be *unlike.*

Caſe 1. To add terms that are like and have like ſigns.

Rule. Add together the coefficients, to their ſum prefix the common ſign, and ſubjoin the common letter or letters.

Examp.
$$\begin{array}{lll} \text{To} & 5ab & 3aa-ab \\ \text{Add} & 4ab & 7aa-2ab \\ & & 4aa-5ab \\ \hline \text{Sum} & 9ab & 14aa-8ab. \end{array}$$

Caſe 2. To add terms that are like, but have unlike ſigns.

Rule. Subtract the leſs coefficient from the greater; prefix the ſign of the greater to the remainder, and ſubjoin the common letter or letters.

Examp.
$$\begin{array}{lll} -4a & +7bc & -5ab \\ +7a & -3bc & +2ab \\ & +\ bc & +3ab \\ \hline +3a & +5bc & 0 \end{array}$$

Caſe 3. To add terms that are unlike.

Rule. Set them all down, one after another, with their ſigns and coefficients prefixed.

Examp.
$$\begin{array}{l} 2a+3b \\ -5c+8 \\ \hline 2a+3b-5c+8 \end{array}$$

Compound quantities are added together, by uniting the ſeveral terms of which they conſiſt, by the preceding rules.

Examp. The ſum of
$$\left\{\begin{array}{l} 5ab-3xy-12cd \\ 7xy-ab+15 \\ 9cd-xy-mn \end{array}\right.$$
$$\text{is } 4ab-3cd+15-mn+3xy$$

The rule for caſe 3. may be conſidered as the general rule for adding all algebraical quantities whatſoever; and by the rules in the two preceding caſes, the like terms in the quantity to be added may be united, ſo as to render the expreſſion in the ſum more ſimple.

Fundamental operations.

Prob. II. *To ſubtract Quantities.*

General Rule. Change the ſigns of the quantity to be ſubtracted into the contrary ſigns, and then add it, ſo changed, to the quantity from which it was to be ſubtracted (by Prob. I); and the ſum ariſing by this addition is the remainder.

Examp.
$$\begin{array}{lll} \text{From} & +5a & 7ab-16bc \\ \text{Subtract} & +3a & 3ab+mb \\ \hline \text{Rem.} & +2a & 4ab-16bc-mb \end{array}$$
$$\begin{array}{ll} \text{From} & 5a-7b+9c+8 \\ \text{Subt.} & 2a-4b+9c-d \\ \hline \text{Rem.} & 3a-3b\ast+8+d \end{array}$$

When a poſitive quantity is to be ſubtracted, the rule is obvious from Def. 3.: In order to ſhow it, when the negative part of a quantity is to be ſubtracted, let $c-d$ be ſubtracted from a, the remainder, according to the rule, is $a-c+d$. For if c is ſubtracted from a, the remainder is $a-c$ (by Def. 3.); but this is too ſmall, becauſe c is ſubtracted inſtead of $c-d$, which is leſs than it by d; the remainder therefore is too ſmall by d; and d being added, it is $a-c+d$, according to the rule.

Otherwiſe, If the quantity d be added to theſe two quantities a and $c-d$, the difference will continue the ſame; that is, the exceſs of a above $c-d$ is equal to the exceſs of $a+d$ above $c-d+d$; that is, to the exceſs of $a+d$ above c, which plainly is $a+d-c$, and is therefore the remainder required.

Prob. III. *To multiply Quantities.*

General Rule for the ſigns. When the ſigns of the two terms to be multiplied are like, the ſign of the product is +; but, when the ſigns are unlike, the ſign of the product is —.

Caſe 1. To multiply two terms.

Rule. Find the ſign of the product by the general rule; after it place the product of the numeral coefficients, and then ſet down all the letters one after another, as in one word.

$$\begin{array}{ll|l|l} \text{Mult.} & +a & +5b & -5ax \\ \text{By} & +b & -3c & -7ab \\ \hline & +ab & -15bc & +35aabx \end{array}$$

The reaſon of this rule is derived from Def. 6. and from the nature of multiplication, which is a repeated addition of one of the quantities to be multiplied as often as there are units in the other. Hence alſo the letters in two terms multiplied together may be placed in any order, and therefore the order of the alphabet is generally preferred.

Caſe 2. To multiply compound quantities.

Rule. Multiply every term of the multiplicand by all the terms of the multiplier, one after another, according to the preceding rule, and then collect all the products into one ſum; that ſum is the product required.

Fundamental operations.

$$\begin{array}{lll} \textit{Examp.}\ \text{Mult.} & 2a+3b & m+x \\ \quad\text{By} & 3ax-4by & m-x \\ \hline & 6aax+9abx & mm+mx \\ & \qquad -8aby-12bby & \quad -mx-xx \\ \hline \text{Prod.} & 6aax+9abx-8aby-12bby & mm * -xx \end{array}$$

$$\begin{array}{ll} \text{Mult.} & a-b \\ \text{By} & c-d \\ \hline & ac-cb \\ & \quad -ad+db \\ \hline \text{Prod.} & ac-cb-ad+db \end{array}$$

Of the general Rule for the Signs.

The reaſon of that rule will appear by proving it, as applied to the laſt mentioned example of $a-b$ multiplied by $c-d$, in which every caſe of it occurs.

Since multiplication is a repeated addition of the multiplicand as often as there are units in the multiplier, hence, if $a-b$ is to be multiplied by c, $a-b$ muſt be added to itſelf as often as there are units in c, and the product therefore muſt be $ca-cb$ (Prob. I.)

But this product is too great; for $a-b$ is to be multiplied, not by c, but by $c-d$ only, which is the exceſs of c above d; d times $a-b$ therefore, or $da-db$, has been taken too much; hence this quantity muſt be ſubtracted from the former part of the product, and the remainder, which (by Prob. II.) is $ca-cb-da+db$, will be the true product required.

Def. 12. When ſeveral quantities are multiplied together, any of them is called a *factor* of the product.

13. The products ariſing from the continual multiplication of the ſame quantity are called the *powers* of that quantity, which is the root. Thus, aa, aaa, $aaaa$, &c. are powers of the root a.

14. Theſe powers are expreſſed, by placing above the root to the right hand, a figure, denoting how often the root is repeated. This figure is called an *index* or *exponent*, and from it the power is denominated. Thus,

$$\left.\begin{array}{r} a \\ aa \\ aaa \\ aaaa \end{array}\right\}\text{is called the}\left\{\begin{array}{l} \text{1ſt} \\ \text{2d} \\ \text{3d} \\ \text{4th} \end{array}\right\}\begin{array}{l} \text{Power of the root} \\ a\text{, and is other-} \\ \text{wiſe expreſſed} \\ \text{by} \end{array}\left\{\begin{array}{l} a^1 \text{ or } a \\ a^2 \\ a^3 \\ a^4 \text{ &c.} \end{array}\right.$$

The 2d and 3d powers are generally called the *ſquare* and *cube*; and the 4th, 5th, and 6th, are alſo ſometimes reſpectively called the *biquadrate*, *ſurſolid*, and *cubocube*.

Cor. Powers of the ſame root are multiplied by adding their exponents. Thus, $a^3 \times a^2 = a^5$, or $aaa \times aa = aaaaa$, $b^3 \times b = b^4$.

Scholium.

Sometimes it is convenient to expreſs the multiplication of quantities, by ſetting them down with the ſign (×) between them, without performing the operation according to the preceding rules; thus $a^2 \times b$ is written inſtead of $a^2 b$; and $\overline{a-b} \times \overline{c-d}$ expreſſes the product of $a-b$, multiplied by $c-d$.

Def. 15. A *vinculum* is a line drawn over any number of terms of a compound quantity, to denote thoſe which are underſtood to be affected by the particular ſign connected with it.

Fundamental operations.

Thus, in the laſt example, it ſhows that the terms $+a$ and $-b$, and alſo c and $-d$ are all affected by the ſign (×). Without the vinculum, the expreſſion $a-b\times c-d$ would mean the exceſs of a above bc and d; and $\overline{a-b}\times c-d$ would mean the exceſs of the product of $a-b$ by c, above d. Thus alſo, $\overline{a+b})^2$ expreſſes the ſecond power of $a+b$, or the product of that quantity multiplied by itſelf; whereas $a+b^2$ would expreſs only the ſum of a and b^2; and ſo of others. By ſome writers a parentheſis ( ) is uſed as a vinculum, and $(a+b)^2$ is the ſame thing as $\overline{a+b})^2$

Prob. IV. *To divide Quantities.*

General Rule for the ſigns. If the ſigns of the diviſor and dividend are like, the ſign of the quotient is +; if they are unlike, the ſign of the quotient is —.

This rule is eaſily deduced from that given in Prob. III.; for, from the nature of diviſion, the quotient muſt be ſuch a quantity as, multiplied by the diviſor, ſhall produce the dividend with its proper ſign.

From Def. 8. the quotient of any two quantities may be expreſſed, by placing the dividend above a line and the diviſor below it. But a quotient may often be expreſſed in a more ſimple and convenient form, as will appear from the following diſtinction of the caſes.

Caſe I. When the diviſor is ſimple, and is a factor of all the terms of the dividend. This is eaſily diſcovered by inſpection; for then the coefficient of the diviſor meaſures that of all the terms of the dividend, and all the letters of the diviſor are found in every term of the dividend.

Rule. The letter or letters in the diviſor are to be expunged out of each term in the dividend, and the coefficients of each term to be divided by the coefficient of the diviſor: the quantity reſulting is the quotient.

Ex. $a)\ ab\,(b.\quad 2aab)\ 6a^3bc-4a^2bdm\ (3ac-2dm.$

The reaſon of this is evident from the nature of diviſion, and from Def. 6. *Note.* It is obvious from corollary to Prob. III. that powers of the ſame root are divided by ſubtracting their exponents.

Thus $a^2)a^3\ (a,\quad a^3)a^7\ (a^4.$ Alſo $a^2b)\ a^3b^6\ (ab^5.$

Caſe II. When the diviſor is ſimple, but not a factor of the dividend.

Rule. The quotient is expreſſed by a fraction, according to Def. 8. viz. by placing the dividend above a line and the diviſor below it.

Thus the quotient of $3ab^2$ divided by $2mbc$ is the fraction $\dfrac{3ab^2}{2mbc}$.

Such expreſſions of quotients may often be reduced to a more ſimple form, as ſhall be explained in the ſecond part of this chapter.

Caſe III. When the diviſor is compound.

Fundamental operations.

Rule 1. The terms of the dividend are to be ranged according to the powers of ſome one of its letters; and thoſe of the diviſor, according to the powers of the ſame letter.

Thus, if $a^2+2ab+b^2$ is the dividend, and $a+b$ the diviſor, they are ranged according to the powers of a.

2. The firſt term of the dividend is to be divided by the firſt term of the diviſor (obſerving the general rule for the ſigns); and this quotient being ſet down as a part of the quotient wanted, is to be multiplied by the whole diviſor, and the product ſubtracted from the dividend. If nothing remain, the diviſion is finiſhed: the remainder, when there is any, is a new dividend.

Thus, in the preceding example, a^2 divided by a, gives a, which is the firſt part of the quotient wanted: and the product of this part by the whole diviſor $a+b$, viz. a^2+ab being ſubtracted from the given dividend, there remains in this example $ab+b^2$.

3. Divide the firſt term of this new dividend by the firſt term of the diviſor as before, and join the quotient to the part already found, with its proper ſign: then multiply the whole diviſor by this part of the quotient, and ſubtract the product from the new dividend; and thus the operation is to be continued till no remainder is left, or till it appear that there will always be a remainder.

Thus, in the preceding example, $+ab$, the firſt term of the new dividend divided by a, gives b; the product of which, multiplied by $a+b$, being ſubtracted from $ab+b^2$, nothing remains, and $a+b$ is the true quotient. The entire operation is as follows.

$$\begin{array}{rl}
a+b) & a^2+2ab+b^2\ (a+b \\
 & \underline{a^2+ab} \\
 & \phantom{a^2+{}}ab+b^2 \\
 & \phantom{a^2+{}}\underline{ab+b^2} \\
 & \phantom{a^2+{}}*\quad *
\end{array}$$

$$\begin{array}{rl}
3a-b) & 3a^3-12a^2-a^2b+10ab-2b^2\ (a^2-4a+2b \\
 & \underline{3a^3-a^2b} \\
 & -12a^2+10ab \\
 & \underline{-12a^2+4ab} \\
 & +6ab-2b^2 \\
 & \underline{+6ab-2b^2} \\
 & *\qquad *
\end{array}$$

$$\begin{array}{rl}
1-a) & 1\ (1+a+a^2+a^3,\ \&c. \\
 & \underline{1-a} \\
 & +a \\
 & \underline{+a-a^2} \\
 & +a^2 \\
 & \underline{+a^2-a^3} \\
 & +a^3,\ \&c.
\end{array}$$

It often happens, as in the laſt example, that there is ſtill a remainder from which the operation may be continued without end. This expreſſion of a quotient is called *an infinite ſeries;* the nature of which ſhall be conſidered afterwards. By comparing a few of the firſt terms, the law of the ſeries may be diſcovered, by which, without any more diviſion, it may be continued to any number of terms wanted.

Fundamental operations.

Of the General Rule.

The reaſon of the different parts of this rule is evident; for, in the courſe of the operation, all the terms of the quotient obtained by it are multiplied by all the terms of the diviſor, and the products are ſucceſſively ſubtracted from the dividend till nothing remain: that, therefore, from the nature of diviſion, muſt be the true quotient.

Note. The ſign $\div$ is ſometimes uſed to expreſs the quotient of two quantities between which it is placed; Thus, $\overline{a^2+x^2}\div\overline{a+x}$, expreſſes the quotient of a^2+x^2 divided by $a+x$.

§ 2. OF FRACTIONS.

Definitions.

1. WHEN a quotient is expreſſed by a fraction, the dividend above the line is called the *numerator;* and the diviſor below it is called the *denominator.*
2. If the numerator is leſs than the denominator, it is called a *proper fraction.*
3. If the numerator is not leſs than the denominator, it is called an *improper fraction.*
4. If one part of a quantity is an integer, and the other a fraction, it is called a *mixt quantity.*
5. The *reciprocal* of a fraction, is a fraction whoſe numerator is the denominator of the other; and whoſe denominator is the numerator of the other. The reciprocal of an integer is the quotient of 1 divided by that integer. Thus,
$\frac{b}{a}$ is the reciprocal of $\frac{a}{b}$; and $\frac{1}{m}$ is the reciprocal of m.

The diſtinctions in Def. 2, 3, 4, properly belong to common arithmetic, from which they are borrowed, and are ſcarcely uſed in algebra.

The operations concerning fractions are founded on the following propoſition:

If the diviſor and dividend be either both multiplied or both divided by the ſame quantity, the quotient is the ſame; or, if both the numerator and denominator of the fraction be either multiplied or divided by the ſame quantity, the value of that fraction is the ſame.

Thus, let $\frac{a}{b}=c$, then $\frac{ma}{mb}=c$. For, from the nature of diviſion, if the quotient $\frac{a}{b}$ $(=c)$ be multiplied by the diviſor b, the product muſt be the dividend a. Hence $\left(\frac{a}{b}\times b=\right)$ $bc=a$, and likewiſe $ma=mbc$, and dividing both by mb, $\frac{ma}{mb}=c$. Converſely, if $\frac{ma}{mb}=c$, then alſo $\frac{a}{b}=c$.

Fundamental operations.

Cor. 1. Hence a fraction may be reduced to another of the ſame value, but of a more ſimple form, by dividing both numerator and denominator by any common meaſure.

Thus, $\frac{30ax-54ay}{12ab}=\frac{5x-9y}{2b}$

$$\frac{8ab+6ac}{4a^2}=\frac{4b+3c}{2a}$$

Cor. 2. A fraction is multiplied by any integer, by multiplying the numerator, or dividing the denominator by that integer: and converſely, a fraction is divided by any integer, by dividing the numerator, or multiplying the denominator by that integer.

PROB. I. *To find the greateſt common Meaſure of two Quantities.*

1. Of pure numbers.

Rule. Divide the greater by the leſs: and, if there is no remainder, the leſs is the greateſt common meaſure required. If there is a remainder, divide the laſt diviſor by it; and thus proceed, continually dividing the laſt diviſor by its remainder, till no remainder is left, and the laſt diviſor is the greateſt common meaſure required.

The greateſt common meaſure of 45 and 63 is 9; the greateſt common meaſure of 187 and 391 is 17. Thus,

$$\begin{array}{l} 45)63(1 \\ \quad\underline{45} \\ \quad 18)45(2 \\ \qquad \underline{36} \\ \qquad 9)18(2 \\ \qquad\quad \underline{18} \\ \qquad\quad 0 \end{array} \qquad\qquad \begin{array}{l} 187)391(2 \\ \quad\underline{374} \\ \quad 17)187(11 \\ \qquad \underline{187} \\ \qquad\ * \end{array}$$

From the nature of this operation, it is plain that it may always be continued till there be no remainder. The rule depends on the two following principles:

1. A quantity which meaſures both diviſor and remainder muſt meaſure the dividend.

2. A quantity which meaſures both diviſor and dividend muſt alſo meaſure the remainder.

For a quantity which meaſures two other quantities, muſt alſo meaſure both their ſum and difference: and, from the nature of diviſion, the dividend conſiſts of the diviſor repeated a certain number of times, together with the remainder. By the firſt it appears, that the number found by this rule is a common meaſure; and by the ſecond, it is plain there can be no greater common meaſure; for, if there were, it muſt neceſſarily meaſure the quantity already found leſs than itſelf, which is abſurd.

When the greateſt common meaſure of algebraical quantities is required, if either of them be ſimple, any common ſimple diviſor is eaſily found by inſpection. If they are both compound, any common ſimple diviſor may alſo be found by inſpection. But when the greateſt compound diviſor is wanted, the preceding rule is to be applied; only,

Fundamental operations.

2. The ſimple diviſors of each of the quantities are to be taken out, the remainders in the ſeveral operations are alſo to be divided by their ſimple diviſors, and the quantities are always to be ranged according to the powers of the ſame letter.

The ſimple diviſors in the given quantities, or in the remainders, do not affect a compound diviſor which is wanted; and hence alſo, to make the diviſion ſucceed, any of the dividends may be multiplied by a ſimple quantity. Beſides the ſimple diviſors in the remainders not being found in the diviſors from which they ariſe, can make no part of the common meaſure ſought; and for the ſame reaſon, if in ſuch a remainder there be any compound diviſor which does not meaſure the diviſor from which it proceeds, it may be taken out.

EXAMPLES.

$$\begin{array}{l} a^2-b^2)\ a^2-2ab+b^2\ (1 \\ \qquad\qquad \underline{a^2-b^2} \end{array}$$

$-2ab+2b^2$ Remainder, which divided by $-2b$ is $a-b)$ a^2-b^2 $(a+b$

$$\begin{array}{l} \underline{a^2-b^2} \\ \ *\quad * \end{array}$$

If the quantities given are $8a^2b^2-10ab^3+2b^4$, and $9a^4b-9a^3b^2+3a^2b^3-3ab^4$. The ſimple diviſors being taken out, *viz.* $2b^2$ out of the firſt, it becomes $4a^2-5ab+b^2$, and $3ab$ out of the ſecond, it is $3a^3-3a^2b+ab^2-b^3$. As the latter is to be divided by the former, it muſt be multiplied by 4, to make the operation ſucceed, and then it is as follows:

$$\begin{array}{l} 4a^2-5ab+b^2)\ 12a^3-12a^2b+4ab^2-4b^3\ (3a \\ \qquad\qquad\qquad \underline{12a^3-15a^2b+3ab^2\qquad\quad} \\ \qquad\qquad\qquad\qquad\ \ 3a^2b+ab^2-4b^3 \end{array}$$

This remainder is to be divided by b, and the new dividend multiplied by 3, to make the diviſion proceed. Thus,

$$\begin{array}{l} 3a^2+ab-4b^2)\ 12a^2-15ab+3b^2\ (4 \\ \qquad\qquad\qquad \underline{12a^2+4ab-16b^2} \\ \qquad\qquad\qquad\quad -19ab+19b^2 \end{array}$$

and this remainder, divided by $-19b$, gives $a-b$, which being made a diviſor, divides $3a^2+ab-4b^2$ without a remainder, and therefore $a-b$ is the greateſt compound diviſor: but there is a ſimple diviſor b, and therefore $\overline{a-b}\times b$ is the greateſt common meaſure required.

PROB. II. *To reduce a Fraction to its loweſt Terms.*

Rule. Divide both numerator and denominator by their greateſt common meaſure, which may be found by Prob. 1.

Thus, $\frac{75abc}{125bcx}=\frac{3a}{5x}$, $25bc$ being the greateſt common meaſure, $\frac{a^4-b^4}{a^5-a^3b^2}=\frac{a^2+b^2}{a^3}$ alſo, $\frac{9a^4b-9a^3b^2+3a^2b^3-3ab^4}{8a^2b^2-10ab^3+2b^4}=\frac{9a^3+3ab^2}{8ab-2b^2}$ the greateſt common meaſure being $\overline{a-b}\times b$ by Prob. 1.

PROB.

Fundamental operations.

Prob. III. *To reduce an Integer to the Form of a Fraction.*

Rule. Multiply the given integer by any quantity for a numerator, and ſet that quantity under the product for a denominator.

Thus, $a=\frac{ma}{m}$, $a+b=\frac{a^2-b^2}{a-b}$.

Cor. Hence, in the following operations concerning fractions, an integer may be introduced; for, by this problem, it may be reduced to the form of a fraction. The denominator of an integer is generally made 1.

Prob. IV. *To reduce Fractions with different Denominators to Fractions of equal Value, that ſhall have the ſame Denominator.*

Rule. Multiply each numerator, ſeparately taken into all the denominators but its own, and the products ſhall give the new numerators. Then multiply all the denominators into one another, and the product ſhall give the common denominator.

Example. Let the fractions be $\frac{a}{b}\,\frac{c}{d}\,\frac{e}{f}$; they are reſpectively equal to $\frac{adf}{bdf}\,\frac{bcf}{bdf}\,\frac{bde}{bdf}$.

The reaſon of the operation appears from the preceding propoſition; for the numerator and denominator of each fraction are multiplied by the ſame quantities; and the value of the fractions therefore is the ſame.

Prob. V. *To add and ſubtract Fractions.*

Rule. Reduce them to a common denominator, then add or ſubtract the numerators; and the ſum or difference ſet over the common denominator is the ſum or remainder required.

Ex. Add together $\frac{a}{b}\,\frac{c}{d}\,\frac{e}{f}$, the ſum is $\frac{adf+cbf+bde}{bdf}$.

From $\frac{a}{b}$ ſubt. $\frac{c}{d}$ the difference is $\frac{ad-bc}{bd}$.

From the nature of diviſion it is evident, that, when ſeveral quantities are to be divided by the ſame diviſor, the ſum of the quotients is the ſame with the quotient of the ſum of the quantities divided by that common diviſor.

In like manner, the difference of two fractions having the ſame denominator, is equal to the difference of the numerators divided by that common denominator.

Cor 1. By Cor. Prob. 3. integers may be reduced to the form of fractions, and hence integers and fractions may be added and ſubtracted by this rule. Hence alſo what is called a mixt quantity may be reduced into the form of a fraction by bringing the integral part into the form of a fraction, with the ſame denominator as the fractional part, and adding or ſubtracting the numerators according as the two parts are connected by the ſigns + or —.

Thus, $b+\frac{c}{d}=\frac{bd+c}{d}$ and $a-\frac{a^2-b^2}{2a}=\frac{2a^2-a^2+b^2}{2a}=\frac{a^2+b^2}{2a}$

Fundamental operations.

Cor. 2. A fraction, whoſe numerator is a compound quantity, may be diſtinguiſhed into parts, by dividing the numerator into ſeveral parts, and ſetting each over the original denominator, and uniting the new fractions (reduced if neceſſary) by the ſigns of their numerators.

Thus, $\frac{a^2-2ab+b^2}{2a}=\frac{a^2}{2a}-\frac{2ab}{2a}+\frac{b^2}{2a}=\frac{a}{2}-b+\frac{b^2}{2a}$

Prob. VI. *To multiply Fractions.*

Rule. Multiply their numerators into one another, to obtain the numerator of the product; and the denominators, multiplied into one another, ſhall give the denominator of the product.

Ex. $\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$. $\frac{a+b}{c}\times\frac{a-b}{d}=\frac{a^2-b^2}{cd}$

For, if $\frac{a}{b}$ is to be multiplied by c, the product is $\frac{ca}{b}$; but if it is to be multiplied only by $\frac{c}{d}$ the former product muſt be divided by d, and it becomes $\frac{ca}{bd}$ (Cor. 2. to the preceding problem.)

Or, let $\frac{a}{b}=m$, and $\frac{c}{d}=n$. Then $a=bm$, and $c=dn$. and $ac=bdmn$, and $(mn=)\ \frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}$.

Prob. VII. *To divide Fractions.*

Rule. Multiply the numerator of the dividend by the denominator of the diviſor; their product ſhall give the numerator of the quotient. Then multiply the denominator of the dividend by the numerator of the diviſor, and their product ſhall give the denominator.

Or, Multiply the dividend by the reciprocal of the diviſor; the product will be the quotient wanted.

Thus, $\left.\frac{a}{b}\right)\frac{c}{d}\left(\frac{bc}{ad}=\frac{c}{d}\times\frac{b}{a}\right.$.

For, if $\frac{c}{d}$ is to be divided by by a, the quotient is $\frac{c}{da}$; but $\frac{c}{d}$ is to be divided, not by a, but by $\frac{a}{b}$; therefore the former quotient muſt be multiplied by b, and it is $\frac{bc}{da}$.

Or, let $\frac{a}{b}=m$, and $\frac{c}{d}=n$; then $a=bm$, and $c=dn$; alſo $ad=bdm$ and $bc=bdn$; therefore $\left(\frac{bdn}{bdm}=\right)\frac{n}{m}=\frac{bc}{ad}$.

Scholium.

By theſe problems, the four fundamental operations may be performed, when any terms of the original quantities, or of thoſe which ariſe in the courſe of the operation, are fractional.

Of Proportion.

Example.

$$
\begin{array}{rl}
\text{Mult.} & \frac{a^2}{2x}-\frac{3ax}{2b} \\
\text{By} & \frac{ab}{3x}-4x \\
\hline
\text{Prod.} & \frac{a^3b}{6x^2}-\frac{a^2}{2}-2a^2+\frac{6ax^2}{b}
\end{array}
$$

$$
\begin{array}{l}
a+x)\,a^2+x^2\,(a-x+\frac{2x^2}{a}-\frac{2x^3}{a^2},\ \&c. \\
\quad a^2+ax \\
\hline
\quad -ax+x^2 \\
\quad -ax-x^2 \\
\hline
\qquad 2x^2 \\
\qquad 2x^2+\frac{2x^3}{a} \\
\hline
\qquad -\frac{2x^3}{a} \\
\qquad -\frac{2x^3}{a}-\frac{2x^4}{a^2} \\
\hline
\qquad\quad +\frac{2x^4}{a^2},\ \&c.
\end{array}
$$

This quotient becomes a ſeries, of which the law of continuation is obvious, without any farther operation.

In ſuch caſes, when we arrive at a remainder of one term, it is commonly ſet down with the diviſor below it, after the other terms of the quotient, which then becomes a mixed quantity. Thus the laſt quotient is alſo expreſſed by $a-x+\frac{2x^2}{a+x}$

CHAP. II.

Of Proportion.

By the preceding operations quantities of the ſame kind may be compared together.

The relation ariſing from this compariſon is called *ratio* or *proportion*, and is of two kinds. If we conſider the difference of the two quantities, it is called *arithmetical proportion:* and if we conſider their quotient, it is called *geometrical proportion*. This laſt being moſt generally uſeful, is commonly called ſimply *proportion*.

1. Of Arithmetical Proportion.

Definition. When of four quantities the difference of the firſt and ſecond is equal to the difference of the third and fourth, the quantities are called *arithmetical proportionals*.

Cor. Three quantities may be arithmetically proportional, by ſuppoſing the two middle terms of the four to be equal.

Prop. In four quantities arithmetically proportional, the ſum of the extremes is equal to the ſum of the means.

Let the four be a, b, c, d. Therefore from Def. $a-b=c-d$; to theſe add $b+d$ and $a+d=b+c$.

Of Proportion.

Cor. 1. Of four arithmetical proportionals, any three being given, the fourth may be found.

Thus, let a, b, c, be the 1ſt, 2d, and 4th terms, and let x be the 3d which is ſought.

Then by def. $a+c=b+x$, and $x=a+c-b$.

Cor. 2. If three quantities be arithmetical proportionals, the ſum of the extremes is double of the middle term; and hence, of three ſuch proportionals, any two being given, the third may be found.

2. Of Geometrical Proportion.

Definition. If of four quantities, the quotient of the firſt and ſecond is equal to the quotient of the third and fourth, theſe quantities are ſaid to be in *geometrical proportion*. They are alſo called *proportionals*. Thus, if a, b, c, d, are the four quantities, then $\frac{a}{b}=\frac{c}{d}$. and their ratio is thus denoted $a:b::c:d$.

Cor. Three quantities may be geometrical proportionals, viz. by ſuppoſing the two middle terms of the four to be equal. If the quantities are a, b, c, then $\frac{a}{b}=\frac{b}{c}$, and the proportion is expreſſed thus, $a:b:c$.

Prop. I. The product of the extremes of four quantities geometrically proportional is equal to the product of the means; and converſely.

Let $a:b::c:d$.

Then by Def. $\frac{a}{b}=\frac{c}{d}$

and multiplying both by bd, $ad=bc$.

If $ad=bc$, then dividing by bd, $\frac{a}{b}=\frac{c}{d}$, that is, $a:b::c:d$.

Cor. 1. The product of the extremes of three quantities, geometrically proportioned, is equal to the ſquare of the middle term.

Cor. 2. Of four quantities geometrically proportional, any three being given, the fourth may be found.

Ex. Let a, b, c, be the three firſt; to find the 4th, let it be x, then $a:b::c:x$, and by this propoſition,

$$ax=bc$$

and dividing both by a, $x=\frac{a}{bc}$.

This coincides with the Rule of Three in arithmetic, and may be conſidered as a demonſtration of it. In applying the rule to any particular caſe, it is only to be obſerved, that the quantities muſt be ſo connected and ſo arranged, that they be proportional, according to the preceding definition.

Cor. 3. Of three geometrical proportionals, any two being given, the third may be found.

Prop. II. If four quantities be geometrically proportional, then if any equimultiples whatever be taken of the firſt and third, and alſo any equimultiples whatever of the ſecond and fourth; if the multiple of the firſt be greater than that of the ſecond, the multiple of the third will be greater than that of the fourth; and if equal, equal; and if leſs, leſs.

For, let a, b, c, d, be the four proportionals. Of the firſt and third, ma and mc may repreſent any equimultiples whatever, and alſo nb, nd, may repreſent any equimultiples of the ſecond and fourth. Since $a : b :: c : d$, $ad = bc$; and hence multiplying by mn, $mnad = mnbc$, and therefore (Conv. Prop. 1.) $ma : nb :: mc : nd$; and from the definition of proportionals, it is plain, that if ma is greater than nb, mc muſt be greater than nd; and if equal, equal; and if leſs, leſs.

Prop. III. If four quantities are proportionals, they will alſo be proportionals when taken alternately or inverſely, or by compoſition, or by diviſion, or by converſion. See Def. 13. 14. 15. 16. 17. of Book V. of Euclid, Simſon's edition.

By Prop. II. they will alſo be proportionals according to Def. 5. Book V. of Euclid; and therefore this propoſition is demonſtrated by propoſitions 16, B. 18, 17, E, of the ſame book.

Otherwiſe algebraically.

Let $a : b :: c : d$, and therefore $ad = bc$.

Altern.	$a : c :: b : d$
Invert.	$b : a :: d : c$
Divid.	$a - b : b :: c - d : d$
Comp.	$a + b : b :: c + d : d$
Convert.	$a : a - b :: c : c - d$.

For ſince $ad = bc$, it is obvious, that in each of theſe caſes the product of the extremes is equal to the product of the means; the quantities are therefore proportionals. (Prop. 1.)

Prop. IV. If four numbers be proportionals, according to Def. 5. B. V. of Euclid, they will be geometrically proportional, according to the preceding definition.

1ſt, Let the four numbers be integers, and let them be a, b, c, d. Then if b times a and b times c be taken, and alſo a times b and a times d, ſince ba the multiple of the firſt is equal to ab the multiple of the ſecond, bc, the multiple of the third, muſt be equal to ad the multiple of the fourth. And ſince $bc = ad$, by Prop. 1. a, b, c, and d, muſt be geometrical proportionals.

2dly, If any of the numbers be fractional, all the four being multiplied by the denominators of the fractions, they continue proportionals, according to Def. 5. B. V. Euclid (by Prop. 4. of that book); and the four integer quantities produced being ſuch proportionals, they will be geometrical proportionals, by the firſt part of this Prop.; and therefore, being reduced by diviſion to their original form, they manifeſtly will remain proportionals, according to the algebraical definition.

CHAP. III.

SECT. I. *Of Equations in general, and of the Solution of ſimple Equations.*

Definitions.

1. AN Equation may in general be defined to be a propoſition aſſerting the equality of two quantities; and is expreſſed by placing the ſign = between them.
2. When a quantity ſtands alone upon one ſide of an equation, the quantities on the other ſide are ſaid to be a *value* of it. Thus in the equation $x = b + y - d$, x ſtands alone on one ſide, and $b + y - d$ is a value of it.
3. When an unknown quantity is made to ſtand alone on one ſide of an equation, and there are only known quantities on the other, that equation is ſaid to be *reſolved*; and the value of the unknown quantity is called a *root* of the equation.
4. Equations containing only one unknown quantity and its powers, are divided into *orders*, according to the higheſt power of the unknown quantity to be found in any of its terms.

$$\text{If the higheſt power of the unknown quantity in any term be the}\left\{\begin{array}{l}\text{1ſt,}\\ \text{2d,}\\ \text{3d, \&c.}\end{array}\right\}\text{The Equation is called}\left\{\begin{array}{l}\textit{Simple,}\\ \textit{Quadrat,}\\ \textit{Cubic,}\text{\&c.}\end{array}\right.$$

But the exponents of the unknown quantity are ſuppoſed to be integers, and the equation is ſuppoſed to be cleared of fractions, in which the unknown quantity, or any of its powers, enter the denominators. Thus, $x + a = \frac{3x - b}{c}$ is a ſimple equation; $3x - \frac{5}{2x} = 12$, when cleared of the fraction by multiplying both ſides by $2x$, becomes $6x^2 - 5 = 24x$, a quadratic. $x^3 - 2x^4 = x^6 - 20$ is an equation of the ſixth order, &c.

As the general relations of quantity which may be treated of in algebra, are almoſt univerſally either that of equality, or ſuch as may be reduced to that of equality, the doctrine of equations becomes one of the chief branches of the ſcience.

The moſt common and uſeful application of algebra is in the inveſtigation of quantities that are unknown, from certain given relations to each other, and to ſuch as are known; and hence it has been called the *analytical art*. The equations employed for expreſſing theſe relations muſt therefore contain one or more unknown quantities; and the principal buſineſs of this art will be, the deducing equations containing only one unknown quantity, and reſolving them.

The ſolution of the different orders of equations will be ſucceſſively explained. The preliminary rules in the following ſection are uſeful in all orders, and are alone ſufficient for the ſolution of ſimple equations.

§ 1. *Of ſimple Equations, and their Reſolution.*

Simple equations are reſolved by the four fundamental operations already explained; and the application of them to this purpoſe is contained in the following rules.

Rule 1. Any quantity may be tranſpoſed from one ſide of an equation to the other, by changing its ſign.

Thus, if $3x - 10 = 2x + 5$
Then, $3x - 2x = 10 + 5$ or $x = 15$
Thus alſo, $5x + b = a + 2x$
By tranſp. $3x = a - b$.

This rule is obvious from prob. 1. and 2.; for it is equivalent to adding equal quantities to both ſides of the equation, or to ſubtracting equal quantities from both ſides.

Cor.

Of Equations.

Cor. The ſigns of all the terms of an equation may be changed into the contrary ſigns, and it will continue to be true.

Rule 2. Any quantity by which the unknown quantity is multiplied may be taken away, by dividing all the other quantities of the equation by it.

Thus, if $ax=b$

$$x=\frac{b}{a}$$

Alſo, if $mx+nb=am$

$$x+\frac{nb}{m}=a$$

For if equal quantities are divided by the ſame quantity, the quotients are equal.

Rule 3. If a term of an equation is fractional, its denominator may be taken away, by multiplying all the other terms by it.

Thus, if $\frac{x}{a}=b+c$ Alſo, if $a-\frac{b}{x}=c$

$x=ab+ac$ $ax-b=cx$

And by tranſ. $ax-cx=b$

And by div. $x=\frac{b}{a-c}$

For if all the terms of the equation are multiplied by the ſame quantity, it remains a true propoſition.

Corollary to the three laſt Rules.

If any quantity be found on both ſides of the equation, with the ſame ſign, it may be taken away from both. (Rule 1.)

Alſo, if all the terms in the equation are multiplied or divided by the ſame quantity, it may be taken out of them all. (Rule 2. and 3.)

Ex. If $3x+a=a+b$, then $3x=b$.
If $2ax+3ab=ma+a^2$, then $2x+3b=m+a$.
If $\frac{x}{3}-\frac{4}{3}=\frac{16}{3}$, then $x-4=16$.

Any ſimple equation may be reſolved by theſe rules in the following manner. *1ſt*, Any fractions may be taken away by R. 3. *2dly*, All the terms including the unknown quantity, may be brought to one ſide of the equation, and the known terms to the other, by R. 1. *Laſtly*, If the unknown quantity is multiplied by any known quantity, it may be made to ſtand alone by R. 2. and the equation will then be reſolved. Def. 3.

Examples of ſimple Equations reſolved by theſe Rules.

I.

If $3x+5=x+9$
R. 1. $2x=4$
R. 2. $x=\frac{4}{2}=2$

II.

If $5x-\frac{5x}{2}+12=\frac{4x}{3}+26$
R. 1. $5x-\frac{5x}{2}-\frac{4x}{3}=14$
R. 3. $30x-15x-8x=84$
Or $7x=84$
R. 2. $x=\frac{84}{7}=12$

III.

If $\frac{5}{x}+\frac{9}{4}=16$
R. 3. $\frac{20}{x}+9=64$
R. 3. $20+9x=64x$
R. 1. $20=55x$
R. 2. $x=\frac{20}{55}=\frac{4}{11}$

§ 2. *Solution of Queſtions producing ſimple Equations.*

From the reſolution of equations we obtain the reſolution of a variety of uſeful problems, both in pure mathematics and phyſics, and alſo in the practical arts founded upon theſe ſciences. In this place, we conſider the application of it to thoſe queſtions where the quantities are expreſſed by numbers, and their magnitude alone is to be conſidered.

When an equation, containing only one unknown quantity, is deduced from the queſtion by the following rules, it is ſometimes called a *final equation.* If it be ſimple, it may be reſolved by the preceding rules; but if it be of a ſuperior order, it muſt be reſolved by the rules afterwards to be explained. The examples in this chapter are ſo contrived, that the final equation may be ſimple.

The rules given in this ſection for the ſolution of queſtions, though they contain a reference to ſimple equations only, are to be conſidered as general, and as applicable to queſtions which produce equations of any order.

General Rule. The unknown quantities in the queſtion propoſed muſt be expreſſed by letters, and the relations of the known and unknown quantities contained in it, or the conditions of it, as they are called, muſt be expreſſed by equations. Theſe equations being reſolved by the rules of this ſcience, will give the anſwer of the queſtion.

For example, if the queſtion is concerning two numbers, they may be called x and y, and the conditions from which they are to be inveſtigated muſt be expreſſed by equations.

Thus, if it be required that the ſum of two numbers ſought be 60, that condition is expreſſed thus	$x+y=60$
If their difference muſt be 24, then	$x-y=24$
If their product is 1640, then	$xy=1640$
If their quotient muſt be 6, then	$\frac{x}{y}=6$
If their ratio is as 3 to 2, then $x:y::3:2$, and therefore	$2x=3y$

Theſe are ſome of the relations which are moſt eaſily expreſſed. Many others occur which are leſs obvious; but as they cannot be deſcribed in particular rules, the algebraical expreſſion of them is beſt explained by examples, and muſt be acquired by experience.

A diſtinct conception of the nature of the queſtion; and of the relations of the ſeveral quantities to which it refers, will generally lead to the proper method of ſtating it, which in effect may be conſidered only as a tranſlation from common language into that of algebra.

Caſe I. When there is only one unknown quantity to be found.

Rule. An equation involving the unknown quantity muſt be deduced from the queſtion (by the general rule). This equation being reſolved by the rules of the laſt ſection, will give the anſwer.

It is obvious, that, when there is only one unknown quantity, there muſt be only one independent equation contained in the queſtion; for any other would be unneceſſary, and might be contradictory to the former.

Examp. 1. To find a number, to which if there be added a half, a third part, and a fourth part of itſelf, the ſum will be 50.

Let it be z: then half of it is $\frac{z}{2}$, a third of it is $\frac{z}{3}$, &c.

Therefore, $z+\frac{z}{2}+\frac{z}{3}+\frac{z}{4}=50$

$$24z+12z+8z+6z=1200$$

$$50z=1200$$

$$z=24.$$

If the operation be more complicated, it may be uſeful to regiſter the ſeveral ſteps of it, as in the following

Examp. 2. A trader allows L. 100 *per annum* for the expences of his family, and augments yearly that part of his ſtock which is not ſo expended by a third of it; at the end of three years his original ſtock was doubled. What had he at firſt?

Let his firſt ſtock be	1	z
Of which he ſpends the firſt year L. 100, and there remains	2	$z-100$
This remainder is increaſed by a third of itſelf	3	$z-100+\frac{z-100}{3}=\frac{4z-400}{3}$
The ſecond year he ſpends L. 100, and there remains	4	$\frac{4z-400}{3}-100=\frac{4z-700}{3}$
He increaſes the remainder by one-third of it	5	$\frac{4z-700}{3}+\frac{4z-700}{9}=\frac{16z-2800}{9}$
The third year he ſpends L. 100, and there remains	6	$\frac{16z-2800}{9}-100=\frac{16z-3700}{9}$
He increaſes it by one-third	7	$\frac{16z-3700}{9}+\frac{16z-3700}{27}=\frac{64z-14800}{27}$
But at the end of the third year his ſtock is doubled; therefore	8	$\frac{64z-14800}{27}=2z$
By R. 3.	9	$64z-14800=54z$
By R. 1.	10	$10z=14800$
By R. 2.	11	$z=1480$

Therefore his ſtock was L. 1480; which being tried, anſwers the conditions of the queſtion.

Caſe II. When there are two unknown quantities.

Rule. Two independent equations involving the two unknown quantities, muſt be derived from the queſtion. A value of one of the unknown quantities muſt be derived from each of the equations: and theſe two values being put equal to each other, a new equation will ariſe, involving only one unknown quantity, and may therefore be reſolved by the preceding rule.

Two equations muſt be deduced from the queſtion; for, from one including two unknown quantities, it is plain, a known value of either of them cannot be obtained, more than two equations would be unneceſſary; and if any third condition were aſſumed at pleaſure, moſt probably it would be inconſiſtent with the other two, and a queſtion containing three ſuch conditions would be abſurd.

It is to be obſerved, however, that the two conditions, and hence the two equations expreſſing them, muſt be independent; that is, the one muſt not be deducible from the other by any algebraical reaſoning: for, otherwiſe, there would in effect be only one equation, under two different forms, from which no ſolution can be derived.

Examp. 3. Two perſons, A and B, were talking of their ages: ſays A to B, Seven years ago I was juſt three times as old as you were, and ſeven years hence I ſhall be juſt twice as old as you will be. I demand their preſent ages.

Let the ages of A and B be reſpectively	1	x and y
Seven years ago they were	2	$x-7$ and $y-7$
Seven years hence they will be	3	$x+7$ and $y+7$
Therefore by Queſt. 1. and 2.	4	$x-7=3\times\overline{y-7}=3y-21$
Alſo by Queſt. 2. and 3.	5	$x+7=2\times\overline{y+7}=2y+14$
By 4. and tranſp.	6	$x=3y-14$
By 5. and tranſp.	7	$x=2y+7$
By 6. and 7.	8	$3y-14=2y+7$
Tranſp. and 8.	9	$y=21$
By 9. and 6. or 7.	10	$x=49$

The ages of A and B then are 49 and 21, which anſwer the conditions.

The operation might have been a little ſhortened by ſubtracting the 4th from 5th, and thus $14=-y+35$; and hence $y=21$. therefore (by 6th) $x=(3y-14)=49$.

Examp. 4. A gentleman diſtributing money among ſome poor people, found he wanted 10s. to be able to give 5s. to each; therefore he gives each 4s. only, and finds he has 5s. left.—To find the number of ſhillings and poor people.

If any queſtion ſuch as this, in which there are two quantities ſought, can be reſolved by means of one letter, the ſolution is in general more ſimple than when two are employed. There muſt be, however, two independent conditions; one of which is uſed in the notation of one of the unknown quantities, and the other gives an equation.

Let the number of poor be	1	z
The number of ſhillings will be	2	$5z-10$
The number of ſhillings is alſo	3	$4z+5$
By 2. and 3.	4	$5z-10=4z+5$.
Tranſp.	5	$z=15$.

The number of poor therefore is 15, and the number of ſhillings is $(4z+5=)$ 65, which anſwer the conditions.

Examp. 5. A courier ſets out from a certain place, and travels at the rate of 7 miles in 5 hours; and 8 hours after, another ſets out from the ſame place, and travels the ſame road, at the rate of 5 miles in 3 hours; I demand how long and how far the firſt muſt travel before he is overtaken by the ſecond?

Let the number of hours which the firſt travelled be	1	y
Then the ſecond travelled	2	$y-8$
The firſt travelled ſeven miles in 5 hours, and therefore in y hours	3	$(5:7::y:)\frac{7y}{5}$ miles
In like manner the ſecond travelled in $y-8$ hours	4	$(3:5::y-8:)\frac{5y-40}{3}$ miles
But they both travelled the ſame number of miles; therefore by 3. and 4.	5	$\frac{5y-40}{3}=\frac{7y}{5}$
Mult.	6	$25y-200=21y$
Tranſp.	7	$4y=200$
Divid.	8	$y=50$

The firſt then travelled 50 hours, the ſecond $(y-8=)$ 42 hours.

The miles travelled by each $\left(\frac{7y}{5}=\frac{5y-40}{3}=\right)70$

Caſe III. When there are three or more unknown quantities.

Rule. When there are three unknown quantities, there muſt be three independent equations ariſing from the queſtion; and from each of theſe a value of one of the unknown quantities muſt be obtained. By comparing theſe three values, two equations will ariſe, involving only two unknown quantities, which may therefore be reſolved by the rule for Caſe 2.

In like manner may the rule be extended to ſuch queſtions as contain four or more unknown quantities; and hence it may be inferred, That, when juſt as many independent equations may be derived from a queſtion as there are unknown quantities in it, theſe quantities may be found by the reſolution of equations.

Examp. 6. To find three numbers, ſo that the firſt, with half the other two, the ſecond with one third of the other two, and the third with one fourth of the other two, may each be equal to 34.

Let the numbers be x, y, z, and the equations are

	1	$x+\frac{y+z}{2}=34$
	2	$y+\frac{x+z}{3}=34$
	3	$z+\frac{x+y}{4}=34$
From the 1ſt	4	$x=\frac{68-y-z}{2}$
From the 2d	5	$x=102-3y-z$
From the 3d	6	$x=136-4z-y$
From 4th and 5th	7	$\frac{68-y-z}{2}=102-3y-z$
7th reduced	8	$y=\frac{136-z}{5}$
5=6, and reduced	9	$y=\frac{3z-34}{2}$
8 and 9	10	$\frac{3z-34}{2}=\frac{136-z}{5}$
10th reduced	11	$15z-170=272-2z$
	12	$17z=442$ or $z=26$
By 8 and 5	13	$y=22$ and $x=10$

Examp. 7. To find a number conſiſting of three places, whoſe digits are in arithmetical proportion; if this number be divided by the ſum of its digits, the quotient will be 48; and if from the number be ſubtracted 198, the digits will be inverted.

Let the 3 digits be	1	x, y, z
Then the number is	2	$100x+10y+z$
If the digits be inverted, it is	3	$100z+10y+x$
The digits are in ar. prop. therefore	4	$x+z=2y$
By queſtion	5	$\frac{100x+10y+z}{x+y+z}=48$
By queſtion	6	$100x+10y+z-198=100z+10y+x$
From 6 and tranſ.	7	$99x=99z+198$
Divid. by 99	8	$x=z+2$
From 4	9	$x=2y-z$
8 and 9	10	$2y-z=z+2$
Tranſp.	11	$y=z+1$
Mult. 5.	12	$100x+10y+z=48x+48y+48z$
Tranſp.	13	$52x=38y+47z$
8 and 11 ſubſtit. for x and y	14	$52z+104=38z+38+47z$
Tranſp.	15	$33z=66$
Divid.	16	$z=2$ $y=(z+1=)\ 3$ $x=(z+2=)\ 4$.

The number then is 432, which ſucceeds upon trial.

It ſometimes happens, that all the unknown quantities, when there are more than two, are not in all the equations expreſſing the conditions, and therefore the preceding rule cannot be literally followed. The ſolution, however, will be obtained by ſuch ſubſtitutions as are uſed in Ex. 7. and 9. or by ſimilar operations, which need not be particularly deſcribed.

Corollary to the preceding Rules.

It appears that, in every queſtion, there muſt be as many independent equations as unknown quantities; if there are not, then the queſtion is called *indeterminate*, becauſe it may admit of an infinite number of anſwers; ſince the equations wanting may be aſſumed at pleaſure. There may be other circumſtances, however, to limit the anſwers to one, or a preciſe number, and which, at the ſame time, cannot be directly expreſſed by equations. Such are theſe; that the numbers muſt be integers, ſquares, cubes, and many others. The ſolution of ſuch problems, which are alſo called *diophantine*, ſhall be conſidered afterwards.

Scholium.

On many occaſions, by particular contrivances, the operations by the preceding rules may be much abridged. This however, muſt be left to the ſkill and practice of the learner. A few examples are the following.

1. It is often eaſy to employ fewer letters than there are unknown quantities, by expreſſing ſome of them from a ſimple relation to others contained in the conditions of the queſtion. Thus the ſolution becomes more eaſy and elegant. (See Ex. 4, 5.)

2. Sometimes it is convenient to expreſs by letters, not the unknown quantities themſelves, but ſome other quantities connected with them, as their ſum, difference, &c. from which they may be eaſily derived. (See Ex. 1. of chap. 5.)

In the operation alſo, circumſtances will ſuggeſt a more eaſy road than that pointed out by the general rules. Two of the original equations may be added together, or may be ſubtracted; ſometimes they muſt be previouſly multiplied by ſome quantity, to render ſuch addition or ſubtraction effectual, in exterminating one of the unknown quantities, or otherwiſe promoting the ſolution. Subſtitutions may be made of the values of quantities, in place of quantities themſelves, and various other ſuch contrivances may be uſed, which will render the ſolution much leſs complicated. (See Ex. 3. 7. and 9.)

SECT. II. *General Solution of Problems.*

In the ſolutions of the queſtions in the preceding part, the given quantities (being numbers) diſappear in the laſt concluſion, ſo that no general rules for like caſes can be deduced from them. But if letters are uſed to denote the known quantities, as well as the unknown, a general ſolution may be obtained, becauſe, during the whole courſe of the operation, they retain their original form. Hence alſo the connection of the quantities will appear in ſuch a manner as to diſcover the neceſſary limitations of the data, when there are any, which is eſſential to the perfect ſolution of a problem. From this method, too, it is eaſy to derive a ſynthetical demonſtration of the ſolution.

When letters, or any other ſuch ſymbols, are employed to expreſs all the quantities, the algebra is ſometimes called *ſpecious* or *literal*.

Examp. 8. To find two numbers, of which the ſum and difference are given.

Let s be the given ſum, and d the given difference. Alſo, let x and y be the two numbers ſought.

$$x+y=s$$

$$x-y=d$$

Whence

$$\left.\begin{array}{l} x=s-y \\ x=d+y \end{array}\right\}$$

$$d+y=s-y$$

$$2y=s-d$$

$$y=\frac{s-d}{2}$$

And $x=\dfrac{s+d}{2}$

Thus, let the given ſum be 100, and the difference 24. Then $x=\left(\frac{s+d}{2}=\frac{124}{2}=\right)62$ & $y=\left(\frac{s-d}{2}=\frac{76}{2}=\right)38$.

In the ſame manner may the canon be applied to any other values of s and d. By reverſing the ſteps in the operation, it is eaſy to ſhow, that if $x=\frac{s+d}{2}$ and $y=\frac{s-d}{2}$, the ſum of x and y muſt be s, and their difference d.

Examp. 9. If A and B together can perform a piece of work in the time a, A and C together in the time b, and B and C together in the time c, in what time will each of them perform it alone?

Let A perform the work in the time x. B in y, and C in z; then as the work is the ſame in all caſes, it may be repreſented by unity.

Of Equations.

By the queſtion	1	$(x : 1 :: a :)\frac{a}{x}=$	to the work performed by	*A* in *a* days
	2	$(y : 1 :: a :)\frac{a}{y}=$		*B* in *a* days
	3	$(x : 1 :: b :)\frac{b}{x}=$		*A* in *b* days
	4	$(z : 1 :: b :)\frac{b}{z}=$		*C* in *b* days
	5	$(y : 1 :: c :)\frac{c}{y}=$		*B* in *c* days
	6	$(z : 1 :: c :)\frac{c}{z}=$		*C* in *c* days
	7	$\frac{a}{x}+\frac{a}{y}=1$ and $ay+ax=xy$		
	8	$\frac{b}{x}+\frac{b}{z}=1$ and $bz+bx=xz$		
	9	$\frac{c}{y}+\frac{c}{z}=1$ and $cz+cy=zy$		
Mult. 7th by $\frac{bc}{xy}$	10	$\frac{abc}{x}+\frac{abc}{y}=bc$		
Mult. 8th by $\frac{ac}{xz}$	11	$\frac{abc}{x}+\frac{abc}{z}=ac$		
Mult. 9th by $\frac{ab}{zy}$	12	$\frac{abc}{y}+\frac{abc}{z}=ab$		
Add 10th, 11th, 12th,	13	$\frac{2abc}{x}+\frac{2abc}{y}+\frac{2abc}{z}=bc+ac+ab$		
From 13th ſubt. twice 10th	14	$\frac{2abc}{z}=ac+ab-bc$ & $z=\frac{2abc}{ac+ab-bc}$		
From 13th ſubt. twice 11th	15	$\frac{2abc}{y}=bc+ab-ac$ & $y=\frac{2abc}{bc+ab-ac}$		
From 13th ſubt. twice 12th	16	$\frac{2abc}{x}=bc+ac-ab$ & $x=\frac{2abc}{bc+ac-ab}$		

Example in numbers. Let $a=8$ days, $b=9$ days, and $c=10$: then $x=14\frac{34}{49}$, $y=17\frac{23}{41}$, and $z=23\frac{7}{31}$. It appears likewiſe that *a*, *b*, *c*, muſt be ſuch, that the product of any two of them muſt be leſs than the ſum of theſe two multiplied by the third. This is neceſſary to give poſitive values of *x*, *y*, and *z*, which alone can take place in this queſtion. Beſides, if *x*, *y*, and *z* be aſſumed as any known numbers whatever, and if values of *a*, *b*, and *c* be deduced from ſteps 7th, 8th and 9th of the preceding operation, it will appear, that *a*, *b*, and *c* will have the property required in the limitation here mentioned.

If *a*, *b*, and *c* were ſuch, that any of the quantities, *x*, *y*, or *z*, became equal to 0, it implies that one of the agents did nothing in the work. If the values of any of theſe quantities be negative, the only ſuppoſition which could give them any meaning would be, that ſome of the agents, inſtead of promoting the work, either obſtructed it, or undid it to a certain extent.

Examp. 10. In queſtion 5th, let the firſt courier travel *p* miles in *q* hours; the ſecond *r* miles in *s* hours; let the interval between their ſetting out be *a*,

Then by working as formerly,

$$a=\frac{qra}{qr-ps}.$$

If particular values be inſerted for theſe letters, a particular ſolution will be obtained for that caſe. Let them denote the numbers in Example 5.

Of Involution and Evolution.

$$\text{Then } x=\left(\frac{qra}{qr-ps}=\frac{5\times5\times8}{5\times5-7\times3}=\frac{200}{4}=\right)50.$$

Here it is obvious, that *qr* muſt be greater than *ps*, elſe the problem is impoſſible; for then the value of *x* would either be infinite or negative. This limitation appears alſo from the nature of the queſtion, as the ſecond courier muſt travel at a greater rate than the firſt, in order to overtake him. For the rate o the firſt courier is to the rate of the ſecond as $\frac{p}{q}$ to $\frac{r}{s}$, that is, as *ps* to *qr*; and therefore *qr* muſt be greater than *ps*.

Scholium.

Sometimes when there are many known quantities in a general ſolution, it may ſimplify the operation to expreſs certain combinations of them by new letters, ſtill to be conſidered as known.

CHAP. IV.

Of Involution and Evolution.

In order to reſolve equations of the higher orders, it is neceſſary to premiſe the rules of *Involution* and *Evolution*.

LEMMA.

The reciprocals of the powers of a quantity may be expreſſed by that quantity, with negative exponents of the ſame denomination. That is, the ſeries *a*, 1, $\frac{1}{a}$, $\frac{1}{a^2}$, $\frac{1}{a^3}$, $\frac{1}{a^m}$, &c. may be expreſſed by a^1, a^0, a^{-1}, a^{-2}, a^{-3}, a^{-m}, &c.

For the rule for dividing the powers of the ſame root was to ſubtract the exponents; if then the index of the diviſor be greater than that of the dividend, the index of the quotient muſt be negative.

Thus, $\frac{a^2}{a^3}=a^{2-3}=a^{-1}$. Alſo, $\frac{a^2}{a^3}=\frac{1}{a^1}$. $\frac{a^m}{a^m}=a^{m-m}=a^0$. And, $\frac{a^m}{a^m}=1$. and ſo on of others.

Cor. 1. Hence any quantity which multiplies either the numerator or denominator of a fraction, may be tranſpoſed from the one to the other, by changing the ſign of its index.

Thus, $\frac{x}{y^2}=xy^{-2}$. And $\frac{a^2x}{y^3}=\frac{a^2}{y^3x^{-1}}$, &c.

Cor. 2. From this notation, it is evident that theſe *negative powers*, as they are called, are multiplied by adding, and divided by ſubtracting their exponents.

Thus, $a^{-2}\times a^{-3}=a^{-5}$.

Or, $\frac{1}{a^2}\times\frac{1}{a^3}=\frac{1}{a^5}=a^{-5}$.

$\frac{a^{-1}}{a^{-3}}=a^2$ Or, $\frac{1}{a^3}\Big)\frac{1}{a}\Big(\frac{a^3}{a}=a^2$

I. *Of Involution.*

To find any power of any quantity is the buſineſs of involution.

Caſe 1. When the quantity is ſimple,

Rule. Multiply the exponents of the letters by the index of the power required, and raiſe the coefficient to the ſame power.

Thus, the 2d power of a is $a^1 \times ^2 = a^2$

The 3d power of $2a^2$ is $8a^2 \times ^3 = 8a^6$

The 3d power of $3ab^3$ is $27a^1 \times ^3 b^3 \times ^3 = 27a^3b^9$.

For the multiplication would be performed by the continued addition of the exponents; and this multiplication of them is equivalent. The ſame rule holds alſo when the ſigns of the exponents are negative.

Rule for the ſigns. If the ſign of the given quantity is +, all its powers muſt be poſitive. If the ſign is —, then all its powers whoſe exponents are even numbers are poſitive; and all its powers whoſe exponents are odd numbers are negative.

This is obvious from the rule for the ſigns in multiplication.

The laſt part of it implies the moſt extenſive uſe of the ſigns +, and —, by ſuppoſing that a negative quantity may exiſt by itſelf.

Caſe 2. When the quantity is compound.

Rule. The powers muſt be found by a continual multiplication of it by itſelf.

Thus, the ſquare of $x+\frac{a}{2}$ is found by multiplying it into itſelf. The product is $x^2+ax+\frac{a^2}{4}$. The cube of $x+\frac{a}{2}$ is got by multiplying the ſquare already found by the root, &c.

Fractions are raiſed to any power, by raiſing both numerator and denominator to that power, as is evident from the rule for multiplying fractions in Chap. I. § 2.

The involution of compound quantities is rendered much eaſier by the binomial theorem; for which ſee Chap. VI.

Note. The ſquare of a binomial conſiſts of the ſquares of the two parts, and twice the product of the two parts.

II. *Of Evolution.*

Evolution is the reverſe of involution, and by it powers are reſolved into their roots.

Def. The root of any quantity is expreſſed by placing before it $\sqrt{}$ (called a *radical ſign*) with a ſmall figure above it, denoting the denomination of that root.

Thus, the ſquare root of a, is $\sqrt[2]{a}$ or $\sqrt{a}$.

The cube root of bc, is $\sqrt[3]{bc}$

The 4th root of a^2b-x^3, is $\sqrt[4]{a^2b-x^3}$

The mth root of c^2-dx, is $\sqrt[m]{c^2-dx}$

General Rule for the Signs.

1. The root of any poſitive power may be either poſitive or negative, if it is denominated by an even number; if the root is denominated by an odd number, it is poſitive only.
2. If the power is negative, the root alſo is negative, when it is denominated by an odd number.
3. If the power is negative, and the denomination of the root even, then no root can be aſſigned.

This rule is eaſily deduced from that given in involution and ſuppoſes the ſame extenſive uſe of the ſigns + and —. If it is applied to abſtract quantities in which a contrariety cannot be ſuppoſed, any root of a poſitive quantity muſt be poſitive only; and any root of a negative quantity, like itſelf, is unintelligible.

In the laſt caſe, though no root can be aſſigned, yet ſometimes it is convenient to ſet the radical ſign before the negative quantity, and then it is called an *impoſſible* or *imaginary* root.

The root of a poſitive power, denominated by an even number, has often the ſign ± before it denoting that it may have either + or —.

The radical ſign may be employed to expreſs any root of any quantity whatever; but ſometimes the root may be accurately found by the following rules; and when it cannot, it may often be more conveniently expreſſed by the methods now to be explained.

Caſe I. When the quantity is ſimple.

Rule. Divide the exponents of the letters by the index of the root required, and prefix the root of the numeral coefficient.

1. The exponents of the letters may be multiples of the index of the root, and the root of the coefficient may be extracted.

Thus, the ſquare root of $a^4 = a^{\frac{4}{2}} = \pm a^2$

$$\sqrt[3]{27a^6} = 3a^{\frac{6}{3}} = 3a^2$$

$$\sqrt[4]{a^4b^{12}} = a^{\frac{4}{4}}b^{\frac{12}{4}} = \pm ab^3.$$

2. The exponents of the letters may not be multiples of the index of the root, and then they become fractions; and when the root of the coefficient cannot be extracted, it may alſo be expreſſed by a fractional exponent, its original index being underſtood to be 1.

Thus, $\sqrt{16a^3b^2} = 4a^{\frac{3}{2}}b$

$$\sqrt[3]{7ax^3} = 7^{\frac{1}{3}}a^{\frac{1}{3}}x = \sqrt[3]{7} \times a^{\frac{1}{3}}x.$$

As evolution is the reverſe of involution, the reaſon of the rule is evident.

The root of any fraction is found by extracting that root out of both numerator and denominator.

Caſe II. When the quantity is compound.

1. To extract the ſquare root.

Rule. 1. The given quantity is to be ranged according to the powers of the letters, as in diviſion.

Thus,

Of Involution and Evolution.

Thus, in the example $a^2+2ab+b^2$. the quantities are ranged in this manner.

2. The ſquare root is to be extracted out of the firſt term (by preceding rules), which gives the firſt part of the root ſought. Subtract its ſquare from the given quantity, and divide the firſt term of the remainder by double the part already found, and the quotient is the ſecond term of the root.

Thus, in this example, the remainder is $2ab+b^2$; and $2ab$ being divided by $2a$, the double of the part found, gives $+b$ for the ſecond part of the root.

3. Add this ſecond part to double of the firſt, and multiply their ſum by the ſecond part: Subtract the product from the laſt remainder, and if nothing remain, the ſquare root is obtained. But, if there is a remainder, it muſt be divided by the double of the parts already found, and the quotient would give the third part of the root, and ſo on.

In the laſt example, it is obvious, that $a+b$ is the ſquare root ſought.

The entire operation is as follows.

$$\begin{array}{rl} & a^2+2ab+b^2\,(a+b \\ & a^2 \\ \hline 2a+b) & +2ab+b^2 \\ \times b) & 2ab+b^2 \\ \hline & * \end{array}$$

$$\begin{array}{rl} & x^4-ax^2+\frac{a^2}{4}\left(x^2-\frac{a}{2}\right. \\ & x^4 \\ \hline 2x^2-\frac{a}{2}) & -ax^2+\frac{a^2}{4} \\ \times-\frac{a}{2}) & -ax^2+\frac{a^2}{4} \\ \hline & * \end{array}$$

The reaſon of this rule appears from the compoſition of a ſquare.

2. To extract any other root.

Rule. Range the quantity according to the dimenſions of its letters, and extract the ſaid root out of the firſt term, and that ſhall be the firſt member of the root required. Then raiſe this root to a dimenſion lower by unit than the number that denominates the root required, and multiply the power that ariſes by that number itſelf. Divide the ſecond term of the given quantity by the product, and the quotient ſhall give the ſecond member of the root required.—In like manner are the other parts to be found, by conſidering thoſe already got as making one term.

Thus, the fifth root of

$$\begin{array}{rl} & a^5+5a^4b+10a^3b^2+10a^2b^3+5ab^4+b^5\,(a+b \\ & a^5 \\ \hline 5a^4 &)\;5a^4b \end{array}$$

And $a+b$ raiſed to the 5th power is the given quantity, and therefore it is the root ſought.

Of Involution and Evolution.

In evolution it will often happen, that the operation will not terminate, and the root will be expreſſed by a ſeries.

Thus the ſquare root of a^2+x^2 becomes a ſeries.

$$\begin{array}{rl} & a^2+x^2\left(a+\frac{x^2}{2a}-\frac{x^4}{8a^3}+\frac{x^6}{16a^5},\ \&c.\right. \\ & a^2 \\ \hline 2a+\frac{x^2}{2a}) & *+x^2 \\ \times\frac{x^2}{2a}) & =x^2+\frac{x^4}{4a^2} \\ \hline 2a+\frac{x^2}{a}-\frac{x^4}{8a^3}) & *-\frac{x^4}{4a^2} \\ \times-\frac{x^4}{8a^3}) & =-\frac{x^4}{4a^2}-\frac{x^6}{8a^4}+\frac{x^8}{64a^6} \\ \hline & *+\frac{x^6}{8a^4}-\frac{x^8}{64a}, \end{array}$$

The extraction of roots by ſeries is much facilitated by the binomial theorem (Chap. vi. Sect. 3.). By ſimilar rules, founded on the ſame principles, are the roots of numbers to be extracted.

III. *Of Surds.*

Def. Quantities with fractional exponents are called *ſurds* or *imperfect powers*.

Such quantities are alſo called *irrational*; in oppoſition to others with integral exponents, which are called *rational*.

Surds may be expreſſed either by the fractional exponents, or by the radical ſign, the denominator of the fraction being its index; and hence the orders of ſurds are denominated from this index.

In the following operations, however, it is generally convenient to uſe the notation by the fractional exponents.

$$a^{\frac{1}{3}}=\sqrt[3]{a}.\sqrt{4ab^2}=2ba^{\frac{1}{2}}. \qquad \sqrt[4]{a^3b^2}=a^{\frac{3}{4}}b^{\frac{3}{4}}{}^{2}.$$

The operations concerning ſurds depends on the following principle: If the numerator and denominator of a fractional exponent be both multiplied or both divided by the ſame quantity, the value of the power is the ſame. Thus $a^{\frac{m}{n}}=a^{\frac{mc}{nc}}$: for let $a^{\frac{m}{n}}=nb$; then $a^m=b^n$, and $a^{mc}=b^{nc}$, and extracting the root nc, $a^{\frac{mc}{cn}}=b^{\frac{nc}{nc}}=b=a^{\frac{m}{n}}$.

Lem. A rational quantity may be put into the form of a ſurd, by reducing the index to the form of a fraction of the ſame value.

Thus, $a=a^{\frac{2}{2}}=\sqrt{a^2}$

$a^2b=a^{\frac{6}{3}}b^{\frac{3}{3}}=\sqrt[3]{a^6b^3}$

Prob. I. *To reduce ſurds of different denominations to others of the ſame value and of the ſame denomination.*

Rule. Reduce the fractional exponents to others of the ſame value and having the ſame common denominator.

Ex. $\sqrt{a}$, $\sqrt[3]{b^2}$ or $a^{\frac{1}{2}}$, $b^{\frac{2}{3}}$

but $a^{\frac{1}{2}}=a^{\frac{3}{6}}$ and $b^{\frac{2}{3}}=b^{\frac{4}{6}}$.

therefore $\sqrt{a}$, and $\sqrt[3]{b^2}$ are reſpectively equal to $\sqrt[6]{a^3}$ and $\sqrt[6]{b^4}$

Prob. II. *To multiply and divide ſurds.*

1. When they are ſurds of the ſame rational quantity, add and ſubtract their exponents.

Thus, $a^{\frac{1}{3}}\times a^{\frac{3}{4}}=a^{\frac{1}{3}+\frac{3}{4}}=a^{\frac{13}{12}}=\sqrt[12]{a^{13}}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt[3]{a^2-b^2}}=\frac{\overline{a^2-b^2}|^{\frac{1}{2}}}{\overline{a^2-b^2}|^{\frac{1}{3}}}=\overline{a^2-b^2}|^{\frac{1}{6}}=\sqrt[6]{a^2-b^2}.$$

2. If they are ſurds of different rational quantities, let them be brought to others of the ſame denomination, if already they are not, by prob. 1. Then, by multiplying or dividing theſe rational quanities, their product or quotient may be ſet under the common radical ſign.

Thus, $\sqrt[m]{a}\times\sqrt[n]{b}=a^{\frac{1}{m}}b^{\frac{1}{n}}=\sqrt[mn]{a^nb^m}$

$$\frac{\sqrt{a^2-b^2}}{\sqrt{a+b}}=\sqrt{\frac{a^2-b^2}{a+b}}=\sqrt{a-b}.$$

$$\frac{\sqrt[4]{a^3b^2}}{\sqrt[3]{a^2b}}=\frac{a^{\frac{3}{4}}b^{\frac{2}{4}}}{a^{\frac{2}{3}}b^{\frac{1}{3}}}=a^{\frac{3}{4}-\frac{2}{3}}b^{\frac{1}{2}-\frac{1}{3}}=a^{\frac{1}{12}}b^{\frac{1}{6}}=$$

$$a^{\frac{1}{12}}b^{\frac{3}{12}}=\sqrt[12]{ab^2}$$

If the ſurds have any rational coefficients, their product or quotient muſt be prefixed. Thus, $a\sqrt{m}\times b\sqrt{n}=ab\sqrt{mn}$. It is often convenient, in the operations of this problem, not to bring the ſurds of ſimple quantities to the ſame denomination, but to expreſs their product or quotient without the radical ſign, in the ſame manner as if they were rational quantities. Thus, the product in Ex. 1. may be $a^{\frac{1}{m}}b^{\frac{1}{n}}$, and the quotient in Ex. 3. $a^{\frac{1}{12}}b^{\frac{1}{6}}$

Cor. If a rational coefficient be prefixed to a radical ſign, it may be reduced to the form of a ſurd by the lemma, and multiplied by this problem; and converſely, if the quantity under the radical ſign be diviſible by a perfect power of the ſame denomination, it may be taken out, and its root prefixed as a coefficient.

$$a\sqrt{b}=\sqrt{a^2b};\ 2\times\sqrt[3]{a}=\sqrt[3]{8a}.$$

Conv. $\sqrt{a^2b^3}=ab\sqrt{b}$; $\sqrt{4a^2-8a^2b}=2a\sqrt{1-2b}$.

Even when the quantity under the radical ſign is not diviſible by a perfect power, it may be uſeful ſometimes to divide ſurds into their component factors, by reverſing the operation of this problem.

Thus $\sqrt{ab}=\sqrt{a}\times\sqrt{b}$, $\sqrt[3]{a^2b-bx^2}=\sqrt[3]{ba-bx}$
$\times\sqrt[3]{a+x}=b^{\frac{1}{3}}\times\sqrt[3]{a-x}\times\sqrt[3]{a+x}.$

Prob. III. *To involve or evolve Surds.*

This is performed by the ſame rules as in other quantities, by multiplying or dividing their exponents by the index of the power or root required.

The notation by negative exponents, mentioned in the lemma at the beginning of this chapter, is applicable to fractional exponents, in the ſame manner as to integers.

Scholium.

The application of the rules of this chapter to the reſolving of equations, ſhall be explained in the ſucceeding chapters, which treat of the ſolution of the different claſſes of them; but ſome examples of their uſe in preparing equations for a ſolution are the following.

If a member of an equation be a ſurd root, then the equation may be freed from any ſurd, by bringing that member firſt to ſtand alone upon one ſide of the equation, and then taking away the radical ſign from it, and raiſing the other ſide to the power denominated by the index of that ſurd.

This operation becomes a neceſſary ſtep towards the ſolution of an equation, when any of the unknown quantities are under the radical ſign.

Example. If $3\sqrt{x^2-a^2}+2y=a+y$
Then $3\sqrt{x^2-a^2}=a-y$
and $9\times\overline{x^2-a^2}=a^2-2ay+y^2$

If the unknown quantity be found only under the radical ſign, and only of the firſt dimenſion, the equation will become ſimple, and may be reſolved by the preceding rules.

Thus, if $\sqrt[3]{4x+16}+5=9$
Then $\sqrt[3]{4x+16}=4$
And $4x+16=64$
$4x=48$
And $x=12$

If $\sqrt[m]{a^2x-b^2x}=a$
Then $a^2x-b^2x=a^m$
$x=\dfrac{a^m}{a^2-b^2}$

If the unknown quantity in a final equation has fractional exponents, by means of the preceding rules a new equation may be ſubſtituted, in which the exponents of the unknown quantity are integers.

Thus, if $x^{\frac{1}{2}}+3x^{\frac{2}{3}}=10$, by reducing the ſurds to the ſame denomination, it becomes $x^{\frac{3}{6}}+3x^{\frac{4}{6}}=10$; and if $z=x^{\frac{1}{6}}$, then $z^3+3z^4=10$; and if this equation be reſolved from a value of z, a value of x may be got by the rules of the next chapter. Thus alſo, if $x+2x^{\frac{1}{2}}-3x^{\frac{1}{3}}=100$. If $x^{\frac{1}{6}}=z$, this equation becomes $z^6+2z^3-3z^2=100$.

In general, if $x^{\frac{p}{q}}+x^{\frac{m}{n}}=a$, by reducing the ſurds to the ſame denomination $x^{\frac{pn}{nq}}+x^{\frac{qm}{qn}}=a$, and if $z^{\frac{1}{qn}}$, then the equation is $z^{pn}+z^{qm}=a$, in which the exponents of z are integers; and z being found, x is to be found from the equation $x^{\frac{1}{qn}}=$

CHAP. V.

EQUATIONS were divided into orders according to the higheſt index of the unknown quantity in any term. (chap. 3.)

Equations are either *pure* or *adfected*.

Def. 1. A *pure equation* is that in which only one power of the unknown quantity is found.

2. An *adfected equation*, is that in which different powers of the unknown quantity are found in the ſeveral terms.

Thus, $a^2+ax=b^3$, $ax^2-b^2=m+x^2$ are pure equations.

And $x^2-ax=b^2$, $x^3+x^2=17$ are adfected.

1. *Solution of pure Equations.*

Rule. Make the power of the unknown qnantity to ſtand alone by the rules formerly given, and then extract the root of the ſame denomination out of both ſides, which will give the value of the unknown quantity.

EXAMPLES.

If $a^2+ax^2=b^3$ $\qquad$ $ax^m-b=x^m-c$

$ax^2=b^3-a^2$ $\qquad$ $ax^m-x^m=b-c$

$x^2=\dfrac{b^3-a^2}{a}$ $\qquad$ $x^m=\dfrac{b-c}{a-1}$

$x=\sqrt{\dfrac{b^3-a^2}{a}}$ $\qquad$ $x=\sqrt[m]{\dfrac{b-c}{a-1}}$

The index of the power may alſo be fractional; as in the laſt example m may be any number whatever. Let $m=\frac{1}{2}$, then as before,

$$x^m=x^{\frac{1}{2}}=\frac{b-c}{a-1}$$

$$\text{And } x=\overline{\frac{b-c}{a-1}}\Big|^2=\frac{b^2-2bc+c^2}{a^2-2a+1}$$

Sometimes different powers of the unknown quantity are found in the equation, yet the ſeveral terms may form on one ſide a perfect power, of which the root being extracted, the equation will become ſimple.

Thus, if $x^3-12x^2+48x=98$, it is eaſy to obſerve that $x^3-12x+48x-64=34$; forming a complete cube, of which the root being extracted, $x-4=\sqrt[3]{34}$. And $x=4+\sqrt[3]{34}$.

Examp. 1. To find four continued proportionals, of which the ſum of the extremes is 56, and the ſum of the means 24.

To reſolve the queſtion in general terms, let the ſum of the extremes be a, the ſum of the means b, and let the difference of the extremes be called z, and the difference of the means y.

Then by Ex. 8. chap. 3.

The proportionals are	1	$\frac{a+z}{2}:\frac{b+y}{2}:\frac{b-y}{2}:\frac{a-z}{2}.$
Mult. by 2 and ſtill	2	$a+z:b+y:b-y:a-z$
From the three firſt	3	$ab-ay+bz-zy=b^2+2by+y^3$
From the three laſt	4	$ab+ay-bz-zy=b^2-2by+y^2$
3d added to 4th	5	$2ab-2zy=2b^2+2y^2$
4th ſubt. from 3d	6	$2bz-2ay=4by$
6th reduced	7	$z=\frac{2by+ay}{b}$
7th ſubſt. for z in 5th	8	$2ab-2\times\frac{2by^2+ay^2}{b}=2b^2+2y^2$
Tranſp. and divide 8th by $\frac{2}{b}$	9	$ab^2-b^3=3by^2+ay^2$
	10	$\frac{ab^2-b^3}{3b+a}=y^2$ and $y=\sqrt{\frac{ab^2-b^3}{3b+a}}$
In numbers	11	$y=\sqrt{\frac{ab^2-b^3}{3b+a}}=b\sqrt{\frac{a-b}{3b+a}}=24\sqrt{\frac{32}{128}}=12$
	12	$z=\frac{2+a}{b}\times y=52$

Hence the four proportionals are 54, 18, 6, 2; and it appears that b muſt not be greater than a, otherwiſe the root becomes impoſſible, and the problem would alſo be impoſſible; which limitation might be deduced alſo from prop. 25. V. of Euclid.

2. *Solution of adfected Quadratic Equations.*

Adfected equations of different orders are reſolved by different rules, ſucceſſively to be explained.

An adfected quadratic equation (commonly called a quadratic) involves the unknown quantity itſelf, and alſo its ſquare: It may be reſolved by the following

Rule. 1. Tranſpoſe all the terms involving the unknown quantity to one ſide, and the known terms to the other; and ſo that the term containing the ſquare of the unknown quantity may be poſitive.

2. If the ſquare of the unknown quantity is multiplied by any coefficient, all the terms of the equation are to be divided by it, ſo that the coefficient of the ſquare of the unknown quantity may be 1.

3. Add to both ſides the ſquare of half the coefficient of the unknown quantity itſelf, and the ſide of the equation involving the unknown quantity will be a complete ſquare.

4. Extract

Equations.

4. Extract the ſquare root from both ſides of the equation, by which it becomes ſimple, and by tranſpoſing the above mentioned half coefficient, a value of the unknown quantity is obtained in known terms, and therefore the equation is reſolved.

The reaſon of this rule is manifeſt from the compoſition of the ſquare of a binomial, for it conſiſts of the ſquares of the two parts, and twice the product of the two parts. (*Note*, at the end of Chap. IV.)

The different forms of quadratic equations, expreſſed in general terms, being reduced by the firſt and ſecond parts of the rule, are theſe;

1. $x^2+ax=b^2$
2. $x^2-ax=b^2$
3. $x^2-ax=-b^2$

Caſe 1. $x^2+ax=b^2$

$$x^2+ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$

$$x+\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$

$$x=\pm\sqrt{b^2+\frac{a^2}{4}}-\frac{a}{2}$$

Caſe 2. $x-{}^{2}ax=b^2$

$$x^2-ax+\frac{a^2}{4}=b^2+\frac{a^2}{4}$$

$$x-\frac{a}{2}=\pm\sqrt{b^2+\frac{a^2}{4}}$$

$$x=\frac{a}{2}\pm\sqrt{b^2+\frac{a^2}{4}}$$

Caſe 3. $x^2-ax=-b^2$

$$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b^2$$

$$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b^2}$$

$$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b^2}.$$

Of theſe caſes it may be obſerved,

1. That if it be ſuppoſed, that the ſquare root of a poſitive quantity may be either poſitive or negative, according to the moſt extenſive uſe of the ſigns, every quadratic equation will have two roots, except ſuch of the third form, whoſe roots become impoſſible.

2. It is obvious, that, in the two firſt forms, one of the roots muſt be poſitive, and the other negative.

3. In the third form, if $\frac{a^2}{4}$, or the ſquare of half the coefficient of the unknown quantity, be greater than b^2, the known quantity, the two roots will be poſitive. If $\frac{a^2}{4}$ be equal to b^2, the two roots then become equal.

But if in this third caſe, $\frac{a^2}{4}$ is leſs than b^2, the quantity under the radical ſign becomes negative, and the two roots are therefore impoſſible. This may be eaſily ſhown to ariſe from an impoſſible ſuppoſition in the original equation.

4. If the equation, however, expreſs the relation of magnitudes abſtractly conſidered, where a contrariety cannot be ſuppoſed to take place, the negative roots cannot be of uſe, or rather there are no ſuch roots; for then a negative quantity by itſelf is unintelligible, and therefore the ſquare root of a poſitive quantity muſt be poſitive only. Hence, in the two firſt caſes, there will be only one root; but in the third, there will be two. For in this third caſe, $x^2-ax=-b^2$, or $ax-x^2=b^2$, it is obvious that x may be either greater or leſs than $\frac{1}{2}a$, and yet ax may be poſitive; and hence $\overline{a-x}\times x=ax-x^2$ may alſo be poſitive, und may be equal to a poſitive given quantity b^2: therefore the ſquare root of $x^2-ax+\frac{1}{4}a^2$ may be either $x-\frac{1}{2}a$ or $\frac{1}{2}a-x$, and both theſe quantities alſo poſitive.

Equations.

Let then $x-\frac{a}{2}=\sqrt{\frac{a^2}{4}-b^2}$ and $x=\frac{a}{2}+\sqrt{\frac{a^2}{4}-b^2}$. Alſo let $\frac{a}{2}-x=\sqrt{\frac{a^2}{4}-b^2}$; and hence $x=\frac{a}{2}-\sqrt{\frac{a^2}{4}-b^2}$, and theſe are the ſame two poſitive roots as were obtained by the general rule.

The general rule is uſually employed, even in queſtions where negative numbers cannot take place, and then the negative roots of the two firſt forms are neglected. Sometimes even only one of the poſitive roots of the third caſe can be uſed, and the other may be excluded by a particular condition in the queſtion. When an impoſſible root ariſes in the ſolution of a queſtion, and if it be reſolved in general terms, the neceſſary limitation of the data will be diſcovered.

When a queſtion can be ſo ſtated as to produce a pure equation, it is generally to be preferred to an adfected. Thus the queſtion in the preceding ſection, by the moſt obvious notation, would produce an adfected equation.

2. *Solution of Queſtions producing Quadratic Equations.*

The expreſſion of the conditions of the queſtion by equations, or the ſtating of it, and the reduction likewiſe of theſe equations, till we arrive at a quadratic equation, involving only one unknown quantity and its ſquare, are effected by the ſame rules which were given for the ſolution of ſimple equations in Chap. III.

Examp. 2. One lays out a certain ſum of money in goods, which he ſold again for L.24, and gained as much per cent. as the goods coſt him: I demand what they coſt him?

If the money laid out be	1	y
The gain will be	2	$24-y$
But this gain is (y:24—y::100:)	3	$\frac{2400-100y}{y}$ per cent.
Therefore by queſtion,	4	$y=\frac{2400-100y}{y}$
And by mult. and tr.	5	$y^2+100y=2400$
Completing the ſquare	6	$y^2+100y\overline{+50}\vert^2=2400+2500$ $=4900$
Extr. the root	7	$y+50=\pm\sqrt{4900}=70$
Tranſp.	8	$y=\pm 70-50=20$ or -120.

The anſwer is 20l. which ſucceeds. The other root, —120, has no place in this example, a negative number being here unintelligible.

Any quadratic equation may be reſolved alſo by the general canons at the beginning of this ſection. That ariſing from this queſtion, (No. 5.) belongs to Caſe I. and $a=100$, $b^2=2400$; therefore,

$$y=\left(-\frac{a}{2}\pm\sqrt{\frac{a^2}{4}+b^2}=\right)-\frac{100}{2}\pm\sqrt{\frac{100^2}{4}+2400}=20 \text{ or } -120 \text{ as before.}$$

Examp. 3. What two numbers are thoſe, whoſe difference is 15, and half of whoſe product is equal to the cube of the leſſer?

Let the leſſer number be	1	x
The greater is	2	$x+15$
By queſtion	3	$\frac{x^2+15x}{2}=x^3$
Divide by x and mult. by 2	4	$x+15=2x^2$
4th prepared -	5	$x^2-\frac{x}{2}=\frac{15}{2}$
Complete ſquare	6	$x^2-\frac{x}{2}+\frac{1}{16}=\frac{15}{2}+\frac{1}{16}=\frac{121}{16}$
Ext. √. -	7	$x-\frac{1}{4}=\pm\frac{11}{4}$
Tranſp. - -	8	$x=3 \text{ or } -\frac{5}{2}$

The numbers therefore are 3 and 18, which anſwer the conditions. This is an example of Caſe 2d, and the negative root is neglected.

A ſolution, indeed, may be repreſented by means of the negative root $-\frac{5}{2}$; for then the other number is $(x+15=)-\frac{5}{2}+15=\frac{25}{2}$. And $\frac{1}{2}\times\frac{25}{2}\times-\frac{5}{2}$, is equal to the cube of $-\frac{5}{2}$. Such a ſolution, though uſeleſs, and even abſurd, it is plain muſt correſpond to the conditions, if thoſe rules with regard to the ſigns be uſed in the application of it, by which it was itſelf deduced. The ſame obſervation may be extended even to impoſſible roots; which being aſſumed as the anſwer of a queſtion, muſt, by reverſing the ſteps of the inveſtigation, correſpond to the original equations, by which the conditions of that queſtion were expreſſed.

Examp. 4. To find two numbers whoſe ſum is 100, and whoſe product is 2059.

Let the given ſum $100=a$, the product $2059=b$, and let one of the numbers ſought be x, the other will be $a-x$. Their product is $ax-x^2$.

Therefore by queſtion	1	$ax-x^2=b$ or $x^2-ax=-b$
Complete the ſquare	2	$x^2-ax+\frac{a^2}{4}=\frac{a^2}{4}-b$
Ext. √ -	3	$x-\frac{a}{2}=\pm\sqrt{\frac{a^2}{4}-b}$
Tranſp. - -	4	$x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b}$
And the other number	5	$a-x=\frac{a}{2}\pm\sqrt{\frac{a^2}{4}-b}$

By inſerting numbers, $x=71$ or 29 and $a-x=29$ or 71, ſo that the two numbers ſought are 71 and 29.

Here it is to be obſerved, that b muſt not be greater than $\frac{a^2}{4}$, elſe the roots of the equation muſt be impoſſible; that is, the given product muſt not be greater than the ſquare of half the given ſum of the numbers ſought. This limitation can eaſily be ſhown from other principles; for the greateſt poſſible product of two parts, into which any number may be divided, is when each of them is a half of it. If b be equal to $\frac{a^2}{4}$, there is only one ſolution, and $x=\frac{a}{2}$, alſo $a-x=\frac{a}{2}$.

Examp. 5. There are three numbers in continual geometrical proportion: The ſum of the firſt and ſecond is 10, and the difference of the ſecond and third is 24. What are the numbers?

Let the firſt be	1	z
The ſecond will be	2	$10-z$
And the third	3	$34-z$
Since $z:10-z:34-z$	4	$z^2-20z+100=34z-z^2$
Tranſp.	5	$2z^2-54z=-100$
Divid.	6	$z^2-27z=-50$
Compl. the ſquare	7	$z^2-27z+\overline{\frac{27}{2}}\Big\rvert^2=\frac{729}{4}-=50\frac{529}{4}$
Extract the √	8	$z-\frac{27}{2}=\pm\sqrt{\frac{529}{4}}=\pm\frac{23}{2}$
Tranſp.	9	$z=\frac{27}{2}\pm\frac{23}{2}=25$ or 2.

But though there are two poſitive roots in this equation, yet one of them only can here be of uſe, the other being excluded by a condition in the queſtion. For as the ſum of the firſt and ſecond is 10, 25 cannot be one of them: 2 therefore is the firſt, and the proportionals will be 2, 8, 32.

This reſtriction will alſo appear from the explanation given of the third form, to which this equation belongs. For z may be leſs than $\frac{27}{2}$, but from the firſt condition of the queſtion it cannot be greater; hence the quantity $z^2-27z+\overline{\frac{27}{2}}\Big\rvert^2$ can have only one ſquare root, viz. $\frac{27}{2}-z$; and this being put equal to $\sqrt{\frac{529}{4}}$, we have by tranſpoſition $z=\frac{27}{2}-\frac{23}{2}=2$, which gives the only juſt ſolution of the queſtion.

From the other root indeed, a ſolution of the queſtion may be repreſented by means of a negative quantity. If the firſt then be 25, the three proportionals will be $25,-15,9$. Theſe alſo muſt anſwer the conditions, according to the rules given for negative quantities, though ſuch a ſolution has no proper meaning.

Beſides, it is to be obſerved, that if the following queſtion be propoſed, ‘ To find three numbers in geometrical proportion, ſo that the difference of the 1ſt and 2d may be 10, and the ſum of the 2d and 3d may be 24,' the equation in ſtep 6th will be produced; for, if the 1ſt be z, the 2d is $z-10$, and the 3d $34-z$, and therefore $34z-z^2=z^2-20z+100$, the very ſame equation as in ſtep 4th. In this queſtion it is plain that the root 25 only can be uſeful, and the three proportionals are 25, 15, 9.

But the neceſſary limitations of ſuch a problem are properly to be derived from a general notation. Let the ſum of the two firſt proportionals be a, and the difference of the two laſt b. If a is not greater than b, the firſt term muſt be the leaſt; but if a be greater than b, the firſt term muſt be either the greateſt or the leaſt.

When the firſt term is the leaſt, the proper notation of the three terms is z, $a-z$, $a+b-z$, and the equation when ordered is $z^2-\frac{3a+b}{2}z=-\frac{a^2}{2}$. If the firſt term be the greateſt, and then a is greater than b, the notation of the terms is z, $a-z$, $a-b-z$, and the correſponding equation is $z^2-\frac{3a-bz}{2}=-\frac{a^2}{2}$.

Of the firſt of theſe equations it may be obſerved, that whatever be the value of a and b, the ſquare of $\frac{3a+b}{4}$, viz, of half the coefficient of z, is greater than $\frac{a^2}{2}$, and therefore the roots are always poſſible. If the ſquare be completed, and the roots extracted, they become $z-\frac{3a+b}{4}=\frac{\sqrt{\overline{3a+b}|^2-8a^2}}{4}$, and $\frac{3a+b}{4}-z=\frac{\sqrt{\overline{3a+b}|^2-8a^2}}{4}$. But in this caſe z is the leaſt of the three terms, and therefore a is greater than $2z$, or $\frac{a}{2}$ is greater than z; much more then is $\frac{3a+b}{4}$ greater than z; and therefore the ſecond root only can be admitted, and $z=\frac{3a+b-\sqrt{\overline{3a+b}|^2-8a^2}}{4}$ is the only proper ſolution.

In the ſecond equation, ſince a is greater than b, $\frac{3a-b}{2}$ muſt be always poſitive, and therefore the equation is neceſſarily of the third form. But the roots are poſſible only when $\overline{\frac{3a-b}{4}}\Big|^2$, is not leſs than $\frac{a^2}{2}$, that is when a^2+b^2 is not leſs than $6ab$, or when $a-b$ is not leſs than $2\sqrt{ab}$. When the roots are poſſible, z may be either greater or leſs than $\frac{3a-a}{4}$, and hence each root gives a proper ſolution; therefore, $z=\frac{3a-b\pm\sqrt{\overline{3a-b}|^2-8a^2}}{4}$.

Ex. Let $a=40$ and $b=6$. The firſt term in this caſe may be aſſumed either as the greateſt or the leaſt. And, firſt, if z be the greateſt, the roots of the equation will be poſſible, ſince $(a^2+b^2=)$ 1636 is greater than $(6ab=)$ 1440. The two values of z are 32 and 25, and the proportionals are either 32, 8, 2, or 25, 15, 9. 2*dly*, If z be aſſumed the leaſt of the proportionals, the two roots of the equation are poſſible, but one of them only can be applied; which is 17.635 nearly; and the three proportionals are 17.635, 22.365, and 28.365, nearly, the roots of the equation being incommenſurate.

In like manner may the limitations of the other queſtion above mentioned be aſcertained.

Though the preceding queſtions have been ſo contrived that the anſwers may be integers, yet in practice it will moſt commonly happen that they muſt be ſurds. When in any queſtion the root of a number which is not a perfect ſquare is to be extracted, it may be continued in decimals, by the common arithmetical rule, to any degree of accuracy which the nature of the ſubject may require.

Scholium.

An equation, in the terms of which two powers only of the unknown quantity are found, and ſuch that the index of the one is double that of the other, may, by the preceding rules, be reduced to a pure equation, and may therefore be reſolved by § 1. of this chapter.

Such an equation may generally be repreſented thus;

$$x^{2m}\pm ax^m=\pm b^n$$

Let $x^m=z$, then $z^2\pm az=\pm b^n$

$$\text{And } x^m\ (=z)=\pm\frac{a}{2}\pm\sqrt{\frac{a^2}{4}\pm b^n}$$

$$\text{Therefore } x=\sqrt[m]{\pm\frac{a}{2}\pm\sqrt{\frac{a^2}{4}\pm b^n}}$$

Examp. 15. To find two numbers, of which the product is 100, and the difference of their ſquare roots 3.

Let the leſs be x, the greater is	1	$\frac{100}{x}$
By queſtion	2	$\frac{10}{\sqrt{x}}-\sqrt{x}=3$
	3	$10-x=3\sqrt{x}=3x^{\frac{1}{2}}$
	4	$x+3x^{\frac{1}{2}}=10$
	5	$x+3x^{\frac{1}{2}}+\frac{9}{4}=10+\frac{9}{4}=\frac{49}{4}$
	6	$x^{\frac{1}{2}}+\frac{3}{2}=\pm\frac{7}{2}$ and $x^{\frac{1}{2}}=2$ or -5
	7	$x=4$ or $x=25$

If $x=4$, the other number is 25; and this is the proper ſolution, for x was ſuppoſed to be the leaſt. In this caſe, indeed, the negative root of the equation being applied according to the rules for negative quantities, gives a poſitive anſwer to the queſtion; and if $x=25$, the other number is 4.

The ſame would have been got, by ſubſtituting in the general theorem $m=\frac{1}{2}$, $a=3$, and $b^n=10$; or, if the leſs number had been called x^2, the equation would not have had fractional exponents.

CHAP. VI.

Of Indeterminate Problems.

It was formerly obſerved (Chap. III.), that if there are more unknown quantities in a queſtion than equations

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tions by which their relations are expreſſed, it is indetermined; or it may admit of an infinite number of anſwers. Other circumſtances, however, may limit the number in a certain manner; and theſe are various, according to the nature of the problem. The contrivances by which ſuch problems are reſolved are ſo very different in different caſes, that they cannot be comprehended in general rules.

Examp. 1. To divide a given ſquare number into two parts, each of which ſhall be a ſquare number.

There are two quantities ſought in this queſtion, and there is only one equation expreſſing their relation; but it is required alſo that they may be rational, which circumſtance cannot be expreſſed by any equation: another condition therefore muſt be aſſumed, in ſuch a manner as to obtain a ſolution in rational numbers.

Let the given ſquare be a^2; let one of the ſquares ſought be x^2, the other is a^2-x^2. Let $rx-a$ alſo be a ſide of this laſt ſquare, therefore

$$r^2x^2-2rxa+a^2=a^2-x^2$$

By tranſp. $\qquad r^2x^2+x^2=2rxa$

Divide by x $\qquad r^2x+x=2ra$

Therefore $\qquad x=\frac{2ra}{r^2+1}$

$$\text{And } rx-a\ \left(=\frac{2r^2a}{r^2+1}-a\right)=\frac{r^2a-a}{r^2+1}$$

Let r therefore be aſſumed at pleaſure, and $\frac{2ra}{r^2+1}$, $\frac{r^2a-a}{r^2+1}$, which muſt always be rational, will be the ſides of the two ſquares required.

Thus, if $a^2=100$; then if $r=3$, the ſides of the two ſquares are 6 and 8, for $36+64=100$.

Alſo let $a^2=64$. Then if $r=2$, the ſides of the ſquares are $\frac{32}{5}$ and $\frac{24}{5}$; and $\frac{1024}{25}+\frac{576}{25}=\frac{1600}{25}=64$.

The reaſon of the aſſumption of $rx-a$ as a ſide of the ſquare a^2-x^2, is that being ſquared and put equal to this laſt, the equation manifeſtly will be ſimple, and the root of ſuch an equation is always rational.

Examp. 2. To find two ſquare numbers whoſe difference is given.

Let x^2 and y^2 be the ſquare numbers, and a their difference.

$$\text{Put } \frac{z+v}{2}=x, \text{ and } \frac{z-v}{2}=y$$

$$\frac{z^2+2zv+v^2}{4}=x^2$$

$$\frac{z^2-2zv+v^2}{4}=y^2$$

$$zv=(x^2-y^2=)\ a.$$

If x and y are required only to be rational, then take v at pleaſure, and $z=\frac{a}{v}$, whence x and y are known.

But if x and y are required to be whole numbers, take for z and v any two factors that produce a, and are both even or both odd numbers. And this is poſſible only where a is either an odd number greater than 1, or a number diviſible by 4. Then $\frac{z+v}{2}$ and $\frac{z-v}{2}$ are the numbers ſought.

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For the product of two odd numbers is odd, and that of two even numbers is diviſible by 4. Alſo, if z and v are both odd or both even, $\frac{z+v}{2}$ and $\frac{z-v}{2}$ muſt be integers.

Ex. 1. If $a=27$, take $v=1$, then $z=27$; and the ſquares are 196 and 169. Or z may be 9 and $v=3$; and then the ſquares are 36 and 9.

2. If $a=12$, take $v=2$, and $z=6$; and the ſquares are 16 and 4.

Examp. 3. To find a ſum of money in pounds and ſhillings, whoſe half is juſt its reverſe.

Note. The reverſe of a ſum of money, as 8l. 12s. is 12l. 8s.

Let x be the pounds and y the ſhillings.

The ſum required is $20x+y$

Its reverſe is - $20y+x$

Therefore - $\frac{20x+y}{2}=20y+x$

$$20x+y=40y+2x$$

$$18x=39y$$

$$x:y::(39:18::)\ 13:6$$

In this equation there are two unknown quantities; and, in general, any two numbers of which the proportion is that of 13 to 6 will agree to it.

But, from the nature of this queſtion, 13 and 6 are the only two that can give the proper anſwer, viz. 13l. 6s. for its reverſe 6l. 13s. is juſt its half.

The ratio of x and y is expreſſed in the loweſt integral terms by 13 and 6; any other expreſſion of it, as the next greater 26 and 12, will not ſatiſfy the problem, as 12l. 26s. is not a proper notation of money in pounds and ſhillings.

CHAP. VII.

Demonſtration of Theorems by Algebra.

ALGEBRA may be employed for the demonſtration of theorems, with regard to all thoſe quantities concerning which it may be uſed as an analyſis; and from the general method of notation and reaſoning, it poſſeſſes the ſame advantages in the one as in the other. The three firſt ſections of this chapter contain ſome of the moſt ſimple properties of ſeries which are of frequent uſe; and the laſt, miſcellaneous examples of the properties of algebraical quantities and numbers.

I. *Of Arithmetical Series.*

Def. When a number of quantities increaſe or decreaſe by the ſame common difference, they form an arithmetical ſeries.

Thus, a, $a+b$, $a+2b$, $a+3b$, &c. x, $x-b$, $x-2b$, &c.

Alſo, 1, 2, 3, 4, 5, 6, &c. and 8, 6, 4, 2, &c.

Prop. In an arithmetical ſeries, the ſum of the firſt and

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and laſt terms is equal to the ſum of any two intermediate terms equally diſtant from the extremes.

Let the firſt term be a, the laſt x, and b the common difference; then $a+b$ will be the ſecond, and $x-b$ the laſt but one, &c.

Thus, $a,\ a+b,\ a+2b,\ a+3b,\ a+4b$, &c.
$x,\ x-b,\ x-2b,\ x-3b,\ x-4b$, &c.

It is plain, that the terms in the ſame perpendicular rank are equally diſtant from the extremes; and that the ſum of any two in it is $a+x$, the ſum of the firſt and laſt.

Cor. 1. Hence the ſum of all the terms of an arithmetical ſeries is equal to the ſum of the firſt and laſt, taken half as often as there are terms.

Therefore, if n be the number of terms, and s the ſum of the ſeries; $s=\overline{a+x}\times\frac{n}{2}$. If $a=0$, then $s=\frac{nx}{2}$.

Cor. 2. The ſame notation being underſtood, ſince any term in the ſeries conſiſts of a, the firſt term, together with b taken as often as the number of terms preceding it, it follows, that $x=a+\overline{n-1}\times b$, and hence $s=\overline{2a+\overline{n-1}\times b}\times\frac{n}{2}$; or by multiplication, $s=\frac{2an+n^2b-nb}{2}$. Therefore from the firſt term, the common difference, and number of terms being given, the ſum may be found.

Ex. Required the ſum of 50 terms of the ſeries 2, 4, 6, 8, &c.

$$s=\frac{2\times2\times50+50^2\times2-50\times2}{2}=\frac{5100}{2}=2550$$

Cor. 3. Of the firſt term, common difference, ſum and number of terms, any three being given, the fourth may be found by reſolving the preceding equation; a, b, s, and n, being ſucceſſively conſidered as the unknown quantity. In the three firſt caſes the equation is ſimple, and in the laſt it is quadratic.

II. *Of Geometrical Series.*

Def. When a number of quantities increaſe by the ſame multiplier, or decreaſe by the ſame diviſor, they form a geometrical ſeries. This common multiplier or diviſor is called the *common ratio.*

Thus, $a,\ ar,\ ar^2$, &c. $a,\ \frac{a}{r},\ \frac{a}{r^2},\ \frac{a}{r^3}$, &c.
1, 2, 4, 8, &c.

Prop. I. The product of the extremes in a geometrical ſeries is equal to the product of any two terms, equally diſtant from the extremes.

Let a be the firſt term, y the laſt, r the common ratio: then the ſeries is,

$$a,\ ar,\ ar^2,\ ar^3,\ ar^4,\ \&c.$$
$$y,\ \frac{y}{r},\ \frac{y}{r^2},\ \frac{y}{r^3},\ \frac{y}{r^4},\ \&c.$$

It is obvious, that any term in the upper rank is equally diſtant from the beginning as that below it from the end; and the product of any two ſuch is equal to ay, the product of the firſt and laſt.

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Prop. II. The ſum of a geometrical ſeries wanting the firſt term, is equal to the ſum of all but the laſt term multiplied by the common ratio.

For, aſſuming the preceding notation of a ſeries, it is plain, that

$$ar+ar^2+ar^3,\ \&c.\ \ldots+\frac{y}{r^3}+\frac{y}{r^2}+\frac{y}{r}+y=$$
$$=r\times\overline{a+ar+ar^2\ \&c.\ \ldots+\frac{y}{r^4}+\frac{y}{r^3}+\frac{y}{r^2}+\frac{y}{r}}$$

Cor. 1. Therefore s being the ſum of the ſeries,

$\overline{s-y}\times r=s-a$. And $s=\frac{yr-a}{r-1}$.

Hence s can be found from a, y, and r; and any three of the four being given, the fourth may be found.

Cor. 2. Since the exponent of r in any term is equal to the number of terms preceding it; hence in the laſt term its exponent will be $n-1$; the laſt term, therefore, $y=ar^{n-1}$, and $s=\frac{ar^n-a}{r-1}=a\times\frac{r^n-1}{r-1}$. Hence of theſe four, s, a, r, n, any three being given, the fourth may be found by the ſolution of equations. If n is not a ſmall number, the caſes of this problem will be moſt conveniently reſolved by logarithms; and of ſuch ſolutions there are examples in the appendix to this part.

Cor. 3. If the ſeries decreaſes, and the number of terms is infinite; then, according to this notation, a the leaſt term will be 0, and $s=\frac{yr}{r-1}$, a finite ſum.

Ex. Required the ſum of the ſeries $1,\ \frac{1}{2},\ \frac{1}{4},\ \frac{1}{8}$, &c. to infinity.

Here $y=1$, and $r=2$. Therefore $s=\frac{1\times2}{2-1}=2$.

What are called in arithmetic *repeating* and *circulating decimals*, are truly geometrical decreaſing ſerieſes, and therefore may be ſummed by this rule.

Thus $.333$, &c. $=\frac{3}{10}+\frac{3}{100}+$, &c. is a geometrical ſeries in which $y=\frac{3}{10}$ and $r=10$; therefore $s=\frac{yr}{r-1}=\frac{3\times10}{10\times\overline{10-1}}=\frac{1}{3}$.

Thus, alſo, $.2424$, &c. $=\frac{8}{33}$, for here $y=\frac{24}{100}$ and $r=100$; therefore $s=\frac{24\times100}{100\times\overline{100-1}}=\frac{24}{99}=\frac{8}{33}$.

III. *Of Infinite Series.*

It was obſerved (Chap. I. and IV.), that in many caſes, if the diviſion and evolution of compound quantities be actually performed, the quotients and roots can only be expreſſed by a ſeries of terms, which may be continued *ad infinitum.* By comparing a few of the firſt terms, the law of the progreſſion of ſuch a ſeries

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ties will frequently be diſcovered, by which it may be continued without any farther operation. When this cannot be done, the work is much facilitated by ſeveral methods; the chief of which is that by the binomial theorem.

Theorem. *Any binomial* (*as* a+b) *may be raiſed to any power* (m) *by the following rules.*

1. From inſpecting a table of the powers of a binomial obtained by multiplication, it appears that the terms without their coefficients are a^{m}, $a^{m-1}b$, $a^{m-2}b^{2}$, $a^{m-3}b^{3}$, &c.

2. The coefficients of theſe terms will be found by the following rule.

Divide the exponent of *a* in any term by the exponent of *b* increaſed by 1, and the quotient multiplied by the coefficient of that term will give the coefficient of the next following term.

This rule is found, upon trial in the table of powers, to hold univerſally. The coefficient of the firſt terms is always 1, and by applying the general rule now propoſed, the coefficients of the terms in order will be as follows: $1, m, m\times\frac{m-1}{2}, m\times\frac{m-1}{2}\times\frac{m-2}{3}$, &c. They may be more conveniently expreſſed thus: $1, Am, B\times\frac{m-1}{2}, C\times\frac{m-2}{3}, D\times\frac{m-3}{4}$, &c. the capitals denoting the preceding coefficient. Hence $\overline{a+b}|^{n} = a^{m} + Ama^{m-1}b + B\times\frac{m-1}{2}\times a^{m-2}b^{2} + C\times\frac{m-2}{3}a^{m-3}b^{3}$, &c. This is the celebrated binomial theorem. It is deduced here by induction only; but it may be rigidly demonſtrated, though upon principles which do not belong to this place.

Cor. 1. As *m* may denote any number, integral or fractional, poſitive or negative; hence the diviſion, involution, and evolution, of a binomial, may be performed by this theorem.

Ex. 1. Let $m=\frac{1}{2}$, then $\overline{a+b}|^{\frac{1}{2}} = a^{\frac{1}{2}} + \frac{1}{2}a^{-\frac{1}{2}}b + \frac{1}{2}\times-\frac{1}{4}\times a^{-\frac{3}{2}}b^{2}+$, &c. This being applied to the extraction of the ſquare root of $a^{2}+x^{2}$ (by inſerting a^{2} for a and x^{2} for b), the ſame ſeries reſults as formerly (Chap. IV.)

Ex. 2. If $\frac{1}{1-r}$ is to be turned into an infinite ſeries, ſince $\frac{1}{1-r} = 1\times\overline{1-r}|^{-1}$, let $a=1$, $b=-r$, and $m=-1$; and the ſame ſeries will ariſe as was obtained by Diviſion (Chap. I.).

In like manner $\frac{r^{2}}{\sqrt{2rz-z^{2}}}$ $(=r^{2}\times\overline{2rz-z^{2}}|^{-\frac{1}{2}})$ may be expreſſed by an infinite ſeries, by ſuppoſing $a=2rz$, $b=-z^{2}$, and $m=-\frac{1}{2}$, and then multiplying that ſeries by r^{2}.

Cor. 2. This theorem is uſeful alſo in diſcovering the *law* of an infinite ſeries produced by diviſion or evolution. Thus, the ſeries expreſſing the ſquare root or $a^{2}+x^{2}$, conſiſts of *a* together with a ſeries of fractions; in the numerators of which are the even powers of *x*, and in the denominators the odd powers of *a*. The numeral coefficients of the terms of the whole ſeries, as deduced by the theorem, will be: $1, +\frac{1}{2\times1}, -\frac{1\times1}{2.2\times1.2}, +\frac{1\times1.3}{2.2.2\times1.2.3}, -\frac{1\times1.3.5}{2.2.2.2\times1.2.3.4}$, &c. the point being uſed (as it often is) to expreſs the product of the numbers between which it is placed. The law of continuation is obvious; and the ſeries may be carried on to any number of terms, without uſing the theorem. Hence alſo the coefficient of the *n*th term is $\frac{1\times1.3.5\text{ \&c.}\ldots(n-2\text{ terms})}{2^{n-1}\times1.2.3.4\text{ \&c. }(n-1)}$; and it is + if *n* is an even number, and — if *n* is odd.

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Note. If the binomial is $a+b$, the ſigns of the terms of any power are all poſitive; if it is $a--b$, the alternate terms are negative, beginning at the ſecond. This theorem may be applied to quantities which conſiſt of more than two parts, by ſuppoſing them diſtinguiſhed into two, and then ſubſtituting for the powers of theſe compound parts their values, to be obtained alſo, if required, from the theorem. Thus, $\overline{a+b+c}|^{2} = \overline{\overline{a+b}+c}|^{2}$.

Scholium.

An infinite ſeries may itſelf be multiplied or divided by another; it may be involved or evolved; and various other operations may be performed upon it which are neceſſary in the higher parts of algebra. The methods for finding the ſum depend upon other principles.

IV. *Properties of Numbers.*

Theor. I. *The ſum of two quantities multiplied by their difference is equal to the difference of their ſquares.*

Let the quantities be repreſented by a and b, then $\overline{a+b}\times\overline{a-b} = a^{2}-b^{2}$, as appears by performing the operation.

Cor. If a and b be any two quantities of which the ſum may be denoted by s, the difference by d, and their product by p, then the following propoſitions will be true.

1. $a^{2}+b^{2}=s^{2}-2p$ 2. $a^{2}-b^{2}=sd$
3. $a^{3}+b^{3}=s^{3}-3ps$ 4. $a^{3}-b^{3}=s^{2}d-dp$
5. $a^{4}+b^{4}=s^{4}-4ps^{2}+2p^{2}$ 6. $a^{4}-b^{4}=s^{3}d-2sdp$, &c.

It is unneceſſary to expreſs theſe propoſitions in words, and the demonſtrations are very eaſy, by raiſing $a+b$ to certain powers, and making proper ſubſtitutions.

Theor. II. *The ſum of any number of terms* (n) *of the odd numbers* 1, 3, 5, *&c. beginning with* 1, *is equal to the ſquare of that number* (n).

In the rule for ſumming an arithmetical ſeries, let $a=1$, $b=2$, and $n=n$, and the ſum of this ſeries will be $s=\frac{2an+n^{2}b-nb}{2}=\frac{2n^{2}}{2}=n^{2}$. Q. E. D.

Demon-
ration of
Theorems.

Theor. III. *The difference of any two ſquare numbers is equal to the ſum of the two roots, together with twice the ſum of the numbers in the natural ſcale between the two roots.*

Let the one number be p, and the other $p+n$, the intermediate numbers are $p+1$, $p+2$ . . . &c. $p+n-1$. The difference of the ſquares of the given numbers is $2pa+n^2$; the ſum of the two roots is $2p+n$, and twice the ſum of the ſeries $\overline{p+1}+\overline{p+2}$ . . . &c. $\overline{p+n-1}$ is (by Cor. 1. 1ſt Sect. of this Chap.) $2s=\overline{2p+n}\times\overline{n-1}$, viz. the ſum of the firſt and laſt multiplied by the number of terms, and it is plain that $2p+n+\overline{2p+n}\times\overline{n-1}=2pn+n^2$. Therefore, &c.

Lem. 1. Let r be any number, and n any integer, r^n-1 is diviſible by $r-1$.

The quotient will be $r^{n-1}+r^{n-2}$, &c. till the index of r be 0, and then the laſt term of it will be 1; for if this ſeries be multiplied by the diviſor $r-1$, it will produce the dividend r^n-1. It will appear alſo by performing the diviſion, and inſerting for n any number.

Lem. 2. Let r be any number, and n any integer odd number, r^n+1 is diviſible by $r+1$. Alſo, if n is any even number, r^n-1 is diviſible by $r+1$.

The quotient in both caſes is $r^{n-1}-r^{n-2}+r^{n-3}$ &c. till the exponent of r be 0, and the laſt term $r^0=1$. If this ſeries conſiſt of an odd number of terms, and be multiplied by $r+1$ the diviſor, the product is r^n+1 the dividend. If the ſeries conſiſt of an even number of terms, the product is r^n-1; but it is plain that the number of terms will be odd only when n is odd, and even only when n is even. The concluſion will be manifeſt by performing the diviſion.

Lem. 3. If r is the root of an arithmetical ſcale, any number in that ſcale may be repreſented in the following manner, a, b, c, &c. being the coefficients or digits, $a+br+cr^2+dr^3+er^4$, &c.

Theor. IV. *If from any number in the general ſcale now deſcribed, the ſum of its digits be ſubtracted, the remainder is diviſible by* r-1.

The number is $a+br+cr^2+dr^3$, &c. and the ſum of the digits is $a+b+c+d$, &c. Subtracting the latter from the former, the remainder is $br-b+cr^2-c+dr^3-d$, &c. $=b\times\overline{r-1}+c\times\overline{r^2-1}+d\times\overline{r^3-1}$, &c. But (by Lem. 1.) r_n-1 is diviſible by $r-1$, whatever integer number n may be, and therefore any multiple of r^n-1 is alſo diviſible by $r-1$: Hence each of the terms, $b\times\overline{r-1}$, $c\times\overline{r^2-1}$, &c. is diviſible by $r-1$, and therefore the whole is diviſible by $r-1$.

Cor. 1. Any number, the ſum of whoſe digits is diviſible by $r-1$, is itſelf diviſible by $r-1$. Let the number be called N, and the ſum of the digits D; then by this prop. $N-D$ is diviſible by $r-1$, and D is ſuppoſed to be diviſible by $r-1$; therefore it is plain that N muſt alſo be diviſible by $r-1$.

Cor. 2. Any number, the ſum of whoſe digits is diviſible by an aliquot part of $r-1$, is alſo diviſible by that aliquot part. For, let N and D denote as before; and ſince $N-D$ (Theor. 4.) is diviſible by $r-1$, it is alſo diviſible by an aliquot part of $r-1$; but D is diviſible by an aliquot part of $r-1$, therefore N is alſo diviſible by that aliquot part.

Demonſtration of Theorems.

Cor. 3. This theorem, with the corollaries, relates to any ſcale whatever. It includes therefore the well known property of 9 and of 3 its aliquot part, in the decimal ſcale; for, ſince $r=10$, $r-1=9$.

Theor. V. *In any number, if from the ſum of the coefficients of the odd powers of* r *the ſum of the coefficients of the even powers be ſubtracted, and the remainder added to the number itſelf, the ſum will be diviſible by* r+1.

In the number $a+br+cr^2+dr^3+er^4+fr^5$, &c. the ſum of the coefficients of the odd powers of r is $b+d+f$, &c. the ſum of the coefficients of the even powers of r is $a+c+e$, &c. If the latter ſum be ſubtracted from the former, and the remainder added to the given number, it makes $br+b+cr^2-c+dr^3+d+er^4-e+fr^5+f$, &c. $=b\times\overline{r+1}+c\times\overline{r^2-1}+d\times\overline{r^3+1}+e\times\overline{r^4-1}+f\times\overline{r^5+1}$, &c. But (by Lem. 2.) $r+1$, r^2-1, r^3+1, &c. are each diviſible by $r+1$, and therefore any multiples of them are alſo diviſible by $r+1$, hence the whole number is diviſible by $r+1$.

Cor. 1. If the difference of the ſum of the even digits, and the ſum of the odd digits of any number be diviſible by $r+1$, the number itſelf is diviſible by $r+1$.

Let the ſum of the even digits (that is, the coefficients of the odd powers of r) be D, the ſum of the odd digits be d, and let the number be N. Then by the theorem $N+D-d$ is diviſible by $r+1$, and it is ſuppoſed that $D-d$ is diviſible by $r+1$; therefore N is diviſible by $r+1$.

Cor. 2. In like manner, if $D-d$ is diviſible by an aliquot part of $r+1$, N will be diviſible by that aliquot part.

Cor. 3. If a number want all the odd powers of r, or if it want all the even powers of r, and if the ſum of its digits be diviſible by $r+1$, that number is diviſible by $r+1$.

Cor. 4. In the common ſcale $r+1=11$, which therefore will have the properties mentioned in this theorem, and the corollaries. Thus, in the number 64834, the ſum of the even digits is 7, the ſum of the odd digits is 18, and the difference is 11, a number diviſible by 11, the given number therefore (Cor. 1.) is diviſible by 11. Thus alſo, the ſum of the digits of 7040308 is diviſible by 11, and therefore the number is diviſible by 11. (Cor. 3.)

Scholium.

Theſe theorems relate to any ſcale whatever, and therefore the properties of $r-1$ in Theor. 4. would in a ſcale of *eight* belong to *ſeven*, and thoſe in Theor. 5. to *nine*. If *twelve* was the root of the ſcale, the former properties would belong to *eleven*, and the latter to *thirteen*.

APPENDIX to Part I.

Algebra may be employed in expreſſing the relations of magnitude in general, and in reaſoning with regard to them. It may be uſed in deducing not only the relations of number, but alſo thoſe of extenſion, and hence thoſe of every ſpecies of quantity expreſſible by numbers or extended magnitudes. In this appendix are mentioned ſome examples of its application to other parts of mathematics, to phyſics, and to the

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the practical calculations of buſineſs. The principles and ſuppoſitions peculiar to theſe ſubjects, which are neceſſary in directing both the algebraical operations, and the concluſions to be drawn from them, are here aſſumed as juſt and proper.

I. *Application of Algebra to Geometry.*

Algebra has been ſucceſsfully applied to almoſt every branch of mathematics; and the principles of theſe branches are often advantageouſly introduced into algebraical calculations.

The application of it to *geometry* has been the ſource of great improvement in both theſe ſciences; on account of its extent and importance it is here omitted, and the principles of it are more particularly explained in the third part of theſe elements.

In this place ſhall be given an example of the uſe of logarithms in reſolving certain algebraical queſtions.

Note. When logarithms are uſed, let ($l.$) denote the logarithm of any quantity before which it is placed.

Ex. To find the number of terms of a geometrical ſeries, of which the ſum is 511, the firſt term 1, and the common ratio 2.

From ſect. 2. chap. 6. it appears that $s=\frac{ar^n-a}{r-1}$, and in this problem, s, r, and a are given, and n is to be found. By reducing the equation $r^n=\frac{s\times\overline{r-1}+a}{a}$ and from the known property of logarithms $n+l.r=l.s\times\overline{r-1}+a-l.a$, and $n=\frac{l.s\times\overline{r-1}+a-l.a}{l.r}$. But here $s=511$, $a=1$, $r=2$, and $n=\frac{l.512}{l.2}=\frac{2.7092700}{0.3010300}=9$.

In like manner may any ſuch equation be reſolved, when the only unknown quantity is an exponent, and when it is the exponent only of one quantity.

Ex. 2. An equation of the following quadratic form $a^2\pm 2ba^x=\pm c$ may be reſolved by logarithms. 1ſt, by ſcholium of Chap. V. $a^x=\pm b\pm\sqrt{b^2\pm c}$. And then x is diſcovered in the ſame manner as in the preceding example. Thus, let $a=2$, $b=10$, and $c=96$ and the equation $2^{2x}-20\times 2^x=-96$. 1ſt, $2^x=10\pm\sqrt{4}=12$ or 8. If $2^x=8$ then $x=\frac{l.8}{l.2}=3$ and $2^6-20\times 2^3=-96$ is a true equation. If $2^x=12$, then $x=\frac{l.12}{l.2}=\frac{1.0791812}{0.3010300}=3.5849$, and this number being inſerted for x in the given equation, by means of logarithms, will anſwer the conditions.

Ex. 3. The ſum of 2000l. has been out at intereſt for a certain time, and 500l. has been at intereſt double of that time, the whole arrear now due reckoning 4 *per cent.* compound intereſt, is 6000l. What were the times?

By the rules in the third part of this appendix for compound intereſt, it is plain that if $R=1.04$, and the time at which the 2000l. is at intereſt be x, the arrear of it will be $2000\times R^x$. The arrear of the 500l. is $500\times R^{2x}$, hence $500\times R^{2x}+2000\times R^x=6000$. This reſolved gives $R^x=2$ and $x=\frac{l.\ 2}{l.\ R}=17.67+$, nearly, that is, 17 years and 8 months nearly, and the double is 35 years and 4 months; which anſwer the conditions.

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II. *Application of Algebra to Phyſics.*

Phyſical quantities which can be divided into parts, that have proportions to each other, the ſame as the proportions of lines to lines, or of numbers to numbers, may be expreſſed by lines and numbers, and therefore by algebraical quantities. Hence theſe mathematical notations may be conſidered as the meaſures of ſuch phyſical quantities; they may be reaſoned upon according to the principles of algebra, and from ſuch reaſonings, new relations of the quantities which they repreſent may be diſcovered.

In thoſe branches of natural philoſophy, therefore, in which the circumſtances of the phenomena can be properly expreſſed by numbers, or geometrical magnitudes, algebra may be employed, both in promoting the inveſtigation of phyſical laws by experience, and alſo in deducing the neceſſary conſequences of laws inveſtigated and preſumed to be juſt.

It is to be obſerved likewiſe, that if various hypotheſes be aſſumed concerning phyſical quantities, without regard to what takes place in nature, their conſequences may be demonſtratively deduced, and thus a ſcience may be eſtabliſhed, which may be properly called *mathematical.* The uſe of algebra in this ſcience, which is ſometimes called *Theoretical Mechanics,* is obvious from the principles already laid down.

In conducting theſe inquiries, it is to be obſerved, that, for the ſake of brevity, the language of algebraical operations is often uſed with regard to phyſical quantities themſelves; though it is always to be underſtood, that, in ſtrict propriety, it can be applied only to the mathematical notations of theſe quantities.

Before illuſtrating this application of algebra by examples, it may be proper to explain a method of ſtating the proportion of variable quantities, and reaſoning with regard to it, which is of general uſe in natural philoſophy.

1. *Of the Proportion of variable Quantities.*

Mathematical quantities are often ſo connected, that when the magnitude of one is varied, the magnitudes of the others are varied, according to a determined rule. Thus, if two ſtraight lines, given in poſition, interſect each other; and, if a ſtraight line, cutting both, moves parallel to itſelf, the two ſegments of the given lines between their interſection and the moving line, however varied, will always have the ſame proportion. Thus alſo, if an ordinate to the diameter of a parabola move parallel to itſelf, the abſciſs will be increaſed or diminiſhed in proportion as the ſquare of the ordinate is increaſed or diminiſhed.

In like manner may algebraical quantities be connected. If x, y, z, &c. repreſent any variable quantities, while a, b, c, repreſent ſuch as are conſtant or invariable, then an equation containing two or more variable quantities, with any number of conſtant quantities, will exhibit a relation of variable quantities, ſimilar to thoſe already mentioned. Thus, if $ax=by$, then $x:y::b:a$, that is, x has a conſtant proportion to y, in whatever way theſe two quantities may be varied. Likewiſe, if $xy^2 = a^2 b$, then $y^2 : a^2 :: b : x$, or $y^2 : \frac{1}{x} :: a^2 : \frac{1}{b}$, that is, y^2 has a conſtant proportion to the reciprocal of x, or y^2 is increaſed in the ſame proportion as x is diminiſhed, and converſely. It is neceſſary to premiſe the following definitions.

Definitions.

Let there be any number of variable quantities, X, Y, Z, V, &c. connected in ſuch a manner, that when X becomes x, Y, Z, V, &c. become reſpectively y, z, v, &c. And let a, b, c, &c. repreſent any conſtant quantities, whether given or unknown. Then

1. If two variable quantities X and Y are ſo connected, that whatever be the values of x and y, $X : x :: Y : y$, this proportion is expreſſed thus, $X = Y$, and X is ſaid to be *directly as* Y, or ſhortly, X is ſaid to be *as* Y.

2. If two variable quantities X and Y are ſo connected, that $X : x :: y : Y$, or $X : x :: \frac{1}{Y} : \frac{1}{y}$, their relation is thus expreſſed, $X = \frac{1}{Y}$; and X is ſaid to be *inverſely*, or *reciprocally as* Y.

3. If X, Y, Z, are three variable quantities, ſo connected that $X : x :: YZ : yz$, their relation is ſo expreſſed, $X = YZ$, and X is ſaid to be *directly as* Y and Z, *jointly*; or X is ſaid to be as Y and Z.

4. If any number of variable quantities as X, Y, Z, V, &c. are ſo connected, that $XY : xy :: \frac{YZ}{V} : \frac{yz}{v}$; then $XY = \frac{YZ}{V}$, and XY is ſaid to be directly as YZ, and inverſely as V, or more explicitly X and Y *jointly*, are *directly as* Y *and* Z *jointly*, and *inverſely as* V.

In like manner are other combinations of variable qualities denoted and expreſſed.

It is to be obſerved alſo, the ſame definitions take place, when the variable quantities are multiplied or divided by any conſtant quantities. Thus, if $aX : ax :: \frac{b}{Y} : \frac{b}{y}$ then $aX = \frac{b}{Y}$, &c.

5. Let the preceding notation of proportion be called a *proportional equation* (A), the equations formerly treated of being in this place, for the ſake of diſtinction, called *abſolute*.

Cor. Every abſolute equation, containing more than one variable quantity, may be conſidered as a proportional equation; and in a proportional equation, if at any particular correſponding values of the variable quantities, the equation becomes abſolute, it will be univerſally abſolute.

Prop. 1. If one ſide of a proportional equation be either multiplied or divided by any conſtant quantity, it will continue to be true. Thus, if $X = \frac{1}{Y}$, then $X = \frac{a^2}{bY}$. For ſince $X = \frac{1}{Y}$ (Def. 3.) $X : x :: \frac{1}{Y} : \frac{1}{y}$, it follows, (Chap. II.) that $X : x :: \frac{a^2}{bY} : \frac{a^2}{by}$, therefore, (Def. 4.) $X = \frac{a^2}{bY}$.

Prop. 2. If the two ſides of a proportional equation be both multiplied, or both divided by the ſame quantity, it will continue to be true.

1*ſt*, If the quantity be conſtant, it is manifeſt from Prop. 1.

2*d*, If the quantity be variable, let $X = Y$, and Z a variable quantity, then $XZ = YZ$. For, ſince $X = Y$, (Def. 2.) $X : x :: Y : y$; multiply the antecedents by Z, and the conſequents by z, then $XZ : xz :: YZ : yz$, therefore (Def. 5.) $XZ = YZ$. In like manner, if $X = Y$, $\frac{X}{Z} = \frac{Y}{Z}$.

Cor. Any variable quantity, which is a factor of one ſide of a proportional equation, may be made to ſtand alone. Thus, if $XY = \frac{Z}{V}$, then $X = \frac{Z}{VY}$; alſo, $Z = XYV$; and $Y = \frac{Z}{XV}$, and alſo $V = \frac{Z}{XY}$, &c. Hence, alſo, if one ſide of a proportional equation be divided by the other, the quotient is a conſtant quantity, *viz.* 1.

Prop. 3. If two proportional equations have a common ſide, the remaining two ſides will form a proportional equation. Alſo, that common ſide will be *as* the ſum or difference of the other two.

Thus, if $X = Y$, and $Y = Z$, then $X = Z$. For $X : x :: Y : y$, and $Y : y :: Z : z$, therefore multiplying theſe ratios, $XY : xy :: YZ : yz$, and by dividing antecedents and conſequents, $X : x :: Z : z$, therefore (Def. 2.) $X = z$.

Likewiſe, if $X = Y$, and $Y = Z$, $Y = X \pm Z$. For ſince $X : x :: Y : y :: Z : z$. (Chap II.) $Y : y :: X \pm Z : x \pm z$, therefore (Def. 5.) $Y = X \pm Z$.

Cor. Hence, one ſide of a proportional equation will be *as* the ſum, or *as* the difference of the two ſides; and the ſum of the two ſides will be *as* their difference. Thus, if $X = Y + Z$, then $X = X + Y + Z$ and $X = X - Y - Z$, and alſo $X + Y + Z = X - Y - Z$.

Prop. 4. If the two ſides of a proportional equation be reſpectively multiplied or divided by the two ſides of any other proportional equation, the products or quotients will form a proportional equation.

Thus, if $X = Y$, and $Z = V$, then $XZ = YV$. For ſince $X : x :: Y : y$, and $Z : z :: V : v$, by multiplying theſe proportions (Chap. I. II.) $XZ : xz :: YV : yv$, therefore (Def. 5.) $XZ = YV$. In like manner in the caſe of diviſion.

Cor. 1. The two ſides of a proportional equation may be raiſed to any power, or any root may be extracted out of both, and the equation will continue to be true.

Thus, if $X = Y$, then $X^m = Y^m$; for ſince $X = Y$,

(A) Theſe terms are uſed only with a view to give more preciſion to the ideas of beginners. In order to avoid the ambiguity in the meaning of the ſign $=$, ſome writers employ the character $\propto$, to denote conſtant proportion; but this is ſeldom neceſſary, as the quantities compared are generally of different kinds, and the relation expreſſed is ſufficiently obvious. See Emerſon's Mathematics, vol. I.

$X:x::Y:y$, and therefore $X^m:x^m::Y^m:y^m$; therefore $X^m=Y^m$. And, if $X=Y$, alſo $X^{\frac{1}{m}}=Y^{\frac{1}{m}}$.

Cor. 2. If two proportional equations have a common ſide, that ſide will be *as* the ſquare root of the product of the other two. Thus if $X=Y$, and $Y=Z$, by this Prop. $Y^2=XZ$, and (Cor. 1.) $Y=\sqrt{XZ}$. Hence alſo, in this caſe, $\sqrt{XZ}=X\pm Z$; for (Prop. 3.) $Y=X\pm Z$.

Cor. 3. If one ſide of a proportional equation be a factor of a ſide of another proportional equation, the remaining ſide of the former may be inſerted in the latter, in place of that factor. Thus, if $X=ZY$, and $Z=\frac{1}{V}$, then $X=\frac{Y}{V}$, as appears by multiplying the two equations, and dividing by Z.

Prop. 5. Any proportional equation may be made abſolute, by multiplying one ſide by a conſtant quantity.

Thus, if $X=Y$, then let two particular correſponding values of theſe variable quantities be aſſumed as conſtant, and let them be a and b, then $X:a::Y:b$, and $Xb=aY$, or $X=Y\times\frac{a}{b}$, an abſolute equation.

Scholium.

1. If there be two variable phyſical qualities, either of the ſame, or of different kinds, which are ſo connected, that when the one is increaſed or diminiſhed, the other is increaſed or diminiſhed in the ſame proportion; or, if the magnitudes of the one, in any two ſituations, have the ſame ratio to each other, as the magnitudes of the other in the correſponding ſituations, the relation of the mathematical meaſure of theſe quantities may be expreſſed by a proportional equation, according to Def. 1.

2. If two variable phyſical quantities be ſo connected, that the one increaſes in the ſame proportion as the other is diminiſhed, and converſely; or, if the magnitudes of the one, in any two ſituations, be reciprocally proportional to the magnitudes of the other, in the correſponding ſituations, the relation of their meaſures may be expreſſed by a proportional equation, according to Def. 2.

3. If three variable phyſical quantities are ſo connected, that one of them is increaſed or diminiſhed, in proportion as both the others are increaſed or diminiſhed; or, if the magnitudes of one of them, in any two ſituations, have a ratio which is compounded of the ratios of the magnitudes of the other two, in the correſponding ſituations, the relation of the meaſures of theſe three may be expreſſed by a proportional equation, according to Def. 3.

4. In like manner may the relations of other combinations of phyſical quantities be expreſſed according to Def. 4. And when theſe proportional equations are obtained, by reaſoning with regard to them, according to the preceding propoſitions, new relations of the phyſical quantities may be deduced.

2. *Examples of Phyſical Problems.*

The uſe of algebra, in natural philoſophy, may be properly illuſtrated by ſome examples of phyſical problems. The ſolution of ſuch problems muſt be derived from known phyſical laws, which, though ultimately founded on experience, are here aſſumed as principles, and reaſoned upon mathematically. The experiments by which the principles are aſcertained admit of various degrees of accuracy; and on the degree of phyſical accuracy in the principles will depend the phyſical accuracy of the concluſions mathematically deduced from them. If the principles are inaccurate, the concluſions muſt, in like manner, be inaccurate; and if the limits of inaccuracy in the principles can be aſcertained, the correſponding limits, in the concluſions derived from them, may likewiſe be calculated.

Examp. 1. Let a glaſs tube, 30 inches (a) long, be filled with mercury, excepting 8 inches (b); and let it be inverted as in the Toricellian experiment, ſo that the 8 inches of common air may riſe to the top: It is required to find at what height the mercury will remain ſuſpended, the mercury in the barometer being at that time 28 inches (d) high.

The ſolution of this problem depends upon the following principles:

1. The preſſure of the atmoſphere is meaſured by the column of mercury in the barometer; and the elaſtic force of the air, in its natural ſtate, which reſiſts this preſſure, is therefore meaſured by the ſame column.

2. In different ſtates, the elaſtic force of the air is reciprocally as the ſpaces which it occupies.

3. In this experiment, the mercury which remains ſuſpended in the tube, together with the elaſtic force of the air in the top of it, being a counterbalance to the preſſure of the atmoſphere, may therefore be expreſſed by the column of mercury in the barometer.

Let the mercury in the tube be x inches, the air in the top of it occupies now the ſpace $a—x$; it occupied formerly b inches, and its elaſtic force was d inches of mercury: Now, therefore, the force muſt be ($a—x:b::d$:) $\frac{bd}{a—x}$ inches. (2.) Therefore (3.) $x+\frac{bd}{a—x}=d$. This reduced, and putting $a+d=2m$ the equation is $x^2—2mx=bd—ad$.

This reſolved gives $x=m\pm\sqrt{m^2+bd—ad}$.

In numbers - - $x=44$ or 14.

One of the roots 44 is plainly excluded in this caſe, and the other, 14, is the true anſwer. If the column of mercury x, ſuſpended in the tube, were a counterbalance to the preſſure of the atmoſphere, expreſſed by the height of the barometer d, together with the meaſure of the elaſtic force of b inches of common air in the ſpace $x—a$, that is, if $x=d+\frac{bd}{x—a}$, or $x—\frac{bd}{x—a}=d$, the equation will be the ſame as before, and the root 44 would be the true anſwer. But the experiment in this queſtion does not admit of ſuch a ſuppoſition.

Examp. 2. The diſtance of the earth and moon (d), and their quantities of matter (t, l), being given, to find the point of equal attraction between them.

Let the diſtance of the point from the earth be x: Its diſtance from the moon will be therefore $d—x$. But gravitation is *as* the matter *directly*, and as the ſquare of the diſtance *inverſely*; therefore the earth's attraction is *as* $\frac{t}{x^2}$; and the moon's attraction is *as* $\frac{l}{\overline{d—x}|^2}$. But theſe are here equal; therefore,

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$$\frac{t}{x^2}=\frac{l}{\overline{d-x}|^2} \text{ and } \frac{\sqrt{t}}{x}=\frac{\sqrt{l}}{d-x}$$

This equation reduced gives $x=\frac{d\sqrt{t}}{\sqrt{t}+\sqrt{l}}$

Or mult. numerator and denominator by $\sqrt{t}-\sqrt{l}$ $\Big\}$ $x=\frac{dt-d\sqrt{tl}}{t-l}$.

In round numbers, let $d=60$ ſemidiameters of the earth, $t=40$, $l=1$, then $x=52$ ſemidiameters nearly. There is another point beyond the moon at which the attractions are equal, and it would be found by putting the ſquare root of $\overline{d-x}|^2$ to be $x-d$, which in this caſe, would be a poſitive quantity; and then $x=\frac{dt+d\sqrt{tl}}{t-l}$ $=72$ nearly. If the quantities had been multiplied before extracting the ſquare roots, the adfected quadratic would have given the ſame two roots.

Examp. 3. Let a ſtone be dropt into an empty pit; and let the time from the dropping of it to the hearing the ſound from the bottom be given: To find the depth of the pit.

Let the given time be a; let the fall of a heavy body in the 1ſt ſecond of time (16.122 feet) be b: alſo, let the motion of ſound in a ſecond (1142 feet) be c.

Let the time of the ſtone's fall be -	1	x
The time in which the ſound of it moves to the top is - - -	2	$a-x$
The deſcent of a falling body is as the ſquare of the time, therefore the depth of the pit is $(1^2:x^2::b:)$ -	3	bx^2
The depth from the motion of ſound is alſo - - - - -	4	$ca-cx$
Therefore 3 and 4 - - -	5	$bx^2=ca-cx$

This equation being reſolved, gives the value of x, and from it may be got bx^2 or $ca-cx$, the depth of the pit.

If the time is 10″, then $x=8.885$ nearly, and the depth is 1273 feet.

There are ſeveral circumſtances in this problem which render the concluſion inaccurate.

1. The value of c and b, on which the ſolution is founded, are derived from experiments, which are ſubject to conſiderable inaccuracies.

2. The reſiſtance of the air has a great effect in retarding the deſcent of heavy bodies, when the velocity becomes ſo great as is ſuppoſed in this queſtion; and this circumſtance is not regarded in the ſolution.

3. A ſmall error, in making the experiment to which this queſtion relates, produces a great error in the concluſion. This circumſtance is particularly to be attended to in all phyſical problems; and, in the preſent caſe, without noticing the preceding imperfections, an error of half a ſecond, in eſtimating the time, makes an error of above 100 feet in the expreſſion of the depth of the pit.

III. *Of Intereſt and Annuities.*

The application of algebra to the calculation of intereſts and annuities, will furniſh proper examples of its uſe in buſineſs. Algebra cannot determine the propriety or juſtice of the common ſuppoſitions on which theſe calculations are founded, but only the neceſſary concluſions reſulting from them.

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Notation.

In the following theorems let p denote any principal ſum of which 1 l. is the unit, t the time during which it bears intereſt, of which one year ſhall be the unit, r the rate of intereſt of 1 l. for one year, and let s be the amount of the principal ſum p with its intereſt for the time t at the rate r.

I. *Of Simple Intereſt.*

$s=p+ptr$, and of theſe four, s, p, t, r, any three being given, the fourth may be found by reſolving a ſimple equation.

The foundation of the canon is very obvious; for the intereſt of 1 l. in one year is r, for t years it is tr, and for p pounds it is ptr; the whole amount of principal and intereſt muſt therefore be $p+ptr=s$.

II. *Of Compound Intereſt.*

When the ſimple intereſt at the end of every year is ſuppoſed to be joined to the principal ſum, and both to bear intereſt for the following year, money is ſaid to bear compound intereſt. The ſame notation being uſed, let $1+r=R$. Then $s=pR^t$.

For the ſimple intereſt of 1 l. in a year is r, and the new principal ſum thereof which bears intereſt during the ſecond year is $(1+r=)$ R; the intereſt of R for a year is rR, and the amount of principal and intereſt at the end of the 2d year, is $R+rR=R\times\overline{1+r}=R^2$. In like manner, at the end of the 3d year it is R^3, and at the end of t years it is R^t, and for the ſum p it is $pR^t=s$.

Cor. 1. Of theſe four p, R, t, s, any three being given the 4th may be found. When t is not very ſmall, the ſolution will be obtained moſt conveniently by logarithms. When R is known r may be found, and converſely.

Ex. If 500 l. has been at intereſt for 21 years, the whole arrear due, rckoning $4\frac{1}{2}$ per cent. compound intereſt, is 1260.12 l. or 1260 l. 2s. 5d. In this caſe $p=500$, $R=1.045$ and $t=21$ and $s=1260.12$, and any one of theſe may be derived by the theorem from the others being known. Thus, to find s; $l.\ R^t=t\times l.\ R=21\times0.0191\ 163=0.4014423$; therefore $R^t=2.520242$ and $s=(pR^t=)\ 500\times2.520242=1260.121$.

Cor. 2. The preſent worth of a ſum (s) in reverſion that is payable after a certain time t is found thus. Let the preſent worth be x, then this money improved by compound intereſt during t produces xR^t, which muſt be equal to s, and if $xR^t=s$, $x=\frac{s}{R^t}$.

Cor. 3. The time in which a ſum is doubled at compound intereſt will be found thus. $pR^t=2p$ and $R^t=2$ and $t=\frac{l.\ 2}{l.\ R}$; thus, if the rate is 5 per cent. $r=.05$ and

$\frac{l.\ 2}{l.\ 1.05}=\frac{0.3010300}{0.0211893}=14.2066$, that is 14 years and 75 days nearly.

Scholium.

Many other ſuppoſitions might be made with regard to the improvement of money by compound intereſt. The intereſt might be ſuppoſed to be joined to the capital, and along with it to bear intereſt at the end

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every month, at the end of every day, or even at the end of every inſtant, and ſuitable calculations might be formed; but theſe ſuppoſitions, being ſeldom uſed in practice, are omitted.

III. *Of Annuities.*

An annuity is a payment made annually for a certain term of years, and the chief problem with regard to it is, 'to determine its preſent worth.' The ſuppoſition on which the ſolution proceeds is, that the money received by the ſeller, being improved by him in a certain manner during the continuance of the annuity, amounts to the ſame ſum as the ſeveral payments received by the purchaſer, improved in the ſame manner. The ſuppoſitions with regard to the improvement may be various. What is called the *method of ſimple intereſt*, in which ſimple intereſt only is reckoned upon the purchaſe-money, and ſimple intereſt on each annuity from the time of payment, is ſo manifeſtly unequitable, as to be univerſally rejected; and the ſuppoſition which is now generally admitted in practice, is the higheſt improvement poſſible on both ſides, viz. by compound intereſt. As the taking compound intereſt is prohibited by law, the realizing of this ſuppoſed improvement requires punctual payment of intereſt, and therefore the intereſt in ſuch calculations is uſually made low. Even with this advantage, it can hardly be rendered effectual in its full extent; it is however univerſally acquieſced in, as the moſt proper foundation of general rules; and when peculiar circumſtances require any different hypotheſis, a ſuitable calculation may be made.

Let then the annuity be called a, and let p be the preſent worth of it or purchaſe-money, t the time of its continuance, and let the other letters denote as formerly.

The ſeller, by improving the price received p, at compound intereſt, at the time the annuity ceaſes, has pR^{t}.

The purchaſer is ſuppoſed to receive the firſt annuity a at the end of the firſt year, which is improved by him for $t-1$ years; it becomes therefore (Th. 2.) aR^{t-1}.

He receives the 2d annuity at the end of the 2d year, and when improved $t-2$, it becomes aR^{t-2}.

The third annuity becomes aR^{t-3}, &c.

The laſt annuity is ſimply a, therefore the whole amount of the improved annuities is the geometrical ſeries $a+aR+aR^{2}$, &c. . . aR^{t-1}. The ſum of this ſeries, by Chap. VI. Sect. 2. is $a\times\frac{R^{t}-1}{R-1}=a\times\frac{R^{t}-1}{r}$.

But, from the nature of the problem, $pR^{t}=a\times\frac{R^{t}-1}{r}$,

and hence $p=a\times\frac{R^{t}-1}{rR^{t}}=a\times\frac{1-\frac{1}{R^{t}}}{r}$.

The ſame concluſion reſults from calculating the preſent worth of the ſeveral annuities, conſidered as ſums payable in reverſion.

Cor. 1. Of theſe four p, a, R, t, any three being given, the fourth may be found, by the ſolution of equations; t is found eaſily by logarithms, R or r can be found only by reſolving an adfected equation of the t order.

Cor. 2. If an annuity has been unpaid for the term t, the arrear, reckoning compound intereſt, will be $a\times\frac{R^{t}-1}{r}$.

Cor. 3. The preſent worth of an annuity in reverſion, that is to commence after a certain time (n), and then to continue t years, is found by ſubtracting the preſent worth for n years from the preſent worth for $n+t$ years, and then

$$p=a\times\frac{R^{t}-1}{rR^{t+n}}=a\times\frac{1-\frac{1}{R^{t}}}{rR^{n}}.$$

Alſo of R, t, n, a, p, any four being given, the fifth may be found.

Cor. 4. If the annuity is to continue for ever, then $R^{t}-1$ and R^{t} may be conſidered as the ſame; and $p=a\times\frac{R^{t}-1}{rR^{t}}=\frac{a}{r}$.

Cor. 5. A perpetuity in reverſion (by *Cor.* 3.) ſince $R^{t}-1=R^{t}$, is $p=\frac{a}{rR^{n}}$.

Prob. When 12 years of a leaſe of 21 were expired, a renewal for the ſame term was granted for 1000l.; 8 years are now expired, and for what ſum muſt a correſponding renewal be made, reckoning 5 *per cent.* compound intereſt?

From the firſt tranſaction the yearly profit rent muſt be deduced; and from this the proper fine in the ſecond may be computed.

In the firſt bargain an annuity in reverſion for 12 years, to commence 9 years hence, was ſold for 1000l. the annuity will therefore be found by *Cor.* 3. in which all the quantities are given, but $a=p\times\frac{rR^{n}}{1-\frac{1}{R^{t}}}$.

and by inſerting numbers, viz. $p=1000$, $t=12$, $n=9$, $r=.05$, and $R=1.05$; and working by logarithms $a=175,029=175$l.—7d.

Next, having found a, the ſecond renewal is made by finding the preſent worth of the annuity a in reverſion, to commence 13 years hence, and to laſt 8 years. In the canon (*Cor.* 3.) inſert for a 175.029, and let $t=8$, $n=13$, and $r=.05$ as before, $p=599.93=609$ l. 18s. 6½d. The fine required.

As theſe computations often become troubleſome, and are of frequent uſe, all the common caſes are calculated in tables, from which the value of any annuity, for any time, at any intereſt, may eaſily be found.

It is to be obſerved alſo, that the preceding rules are computed on the ſuppoſition of the annuities being paid yearly; and therefore, if they be ſuppoſed to be paid half yearly, or quarterly, the concluſions will be ſomewhat different, but they may be eaſily calculated on the preceding principles.

The calculations of life annuities, depend partly upon the principles now explained, and partly on phyſical principles, from the probable duration of human life, as deduced from bills of mortality.

PART II.

Of the General Properties and Reſolutions of EQUATIONS of all Orders.

CHAP. I.

Of the Origin and Compoſition of Equations; and of the Signs and Coefficients of their Terms.

IN order to reſolve the higher orders of equations, and to inveſtigate their general affections, it is proper firſt to conſider their origin from the combination of inferior equations.

As it would be impoſſible to exhibit particular rules for the ſolution of every order of equations, their number being indefinite; there is a neceſſity of deducing rules from their general properties, which may be equally applicable to all.

In the application of algebra to certain ſubjects, and eſpecially to geometry, there may be an oppoſition in the quantities, analogous to that of addition and ſubtraction, which may therefore be expreſſed by the ſigns + and —. Hence theſe ſigns may be underſtood by abſtraction, to denote contrariety in general; and therefore, in this method of treating of equations, negative roots are admitted as well as poſitive. In many caſes the negative will have a proper and determinate meaning; and when the equation relates to magnitude only, where contrariety cannot be ſuppoſed to exiſt, theſe roots are neglected, as in the caſe of quadratic equations formerly explained. There is beſides this advantage in admitting negative roots, that both the properties of equations from which their reſolution is obtained, and alſo thoſe which are uſeful in the many extenſive applications of algebra, become more ſimple and general, and are more eaſily deduced.

In this general method, all the terms of any equation are brought to one ſide, and the equation is expreſſed by making them equal to 0. Therefore, if a root of the equation be inſerted inſtead of (x) the unknown quantity, the poſitive terms will be equal to the negative, and the whole muſt be equal to 0.

Def. When any equation is put into this form, the term in which (x) the unknown quantity is of the higheſt power, is called the *Firſt*; that in which the index of x is leſs by 1, is the *Second*, and ſo on, till the laſt into which the unknown quantity does not enter, and which is called the *Abſolute* term.

Prop. I. If any number of equations be multiplied together, an equation will be produced, of which the dimenſion (A) is equal to the ſum of the dimenſions of the equations multiplied.

If any number of ſimple equations be multiplied together, as $x-a=0$, $x-b=0$, $x-c=0$, &c. it is obvious that the product will be an equation of a dimenſion, containing as many units as there are ſimple equations. In like manner, if higher equations are multiplied together, as a cubic and a quadratic, one of the fifth order is produced, and ſo on.

Converſely. An equation of any dimenſion is conſidered as compounded either of ſimple equations, or of others, ſuch that the ſum of their dimenſions is equal to the dimenſion of the given one. By the reſolution of equations, theſe inferior equations are diſcovered, and by inveſtigating the component ſimple equations, the roots of any higher equation are found.

Cor. 1. Any equation admits of as many ſolutions, or has as many roots as there are ſimple equations which compoſe it, that is, as there are units in the dimenſion of it.

Cor. 2. And converſely, no equation can have more roots than the units in its dimenſion.

Cor. 3. Imaginary or impoſſible roots muſt enter an equation by pairs; for they ariſe from quadratics, in which both the roots are ſuch.

Hence alſo, an equation of an even dimenſion may have all its roots, or any even number of them impoſſible, but an equation of an odd dimenſion muſt at leaſt have one poſſible root.

Cor. 4. The roots are either poſitive or negative, according as the roots of the ſimple equations, from which they are produced, are poſitive or negative.

Cor. 5. When one root of an equation is diſcovered, one of the ſimple equations is found, from which the given one is compounded. The given equation, therefore, being divided by this ſimple equation, will give an equation of a dimenſion lower by 1. Thus any equation may be depreſſed as many degrees as there are roots found by any method whatever.

Prop. II. To explain the general properties of the ſigns and coefficients of the terms of an equation.

Let $x-a=0$, $x-b=0$, $x-c=0$, $x-d=0$, &c. be ſimple equations, of which the roots are any poſitive quantities $+a$, $+b$, $+c$, $+d$, &c. and let $x+m=0$, $x+n=0$, &c. be ſimple equations, of which the roots are any negative quantities $-m$, $-n$, &c. and let any number of theſe equations be multiplied together, as in the following table:

$$\begin{array}{l}
x-a=0 \\
\times\, x-b=0 \\
\hline
\left.\begin{array}{l} =x^2-ax \\ \quad\;\; -bx+ab \end{array}\right\}=0, \text{ a Quadratic.} \\
\times\, x-c=0 \\
\hline
\end{array}$$

(A) [illegible] *dimenſion*, in this treatiſe is uſed in ſenſes ſome what different, but ſo as not to create any ambiguity. In this chapter it means either the order of an equation, or the number denoting that order, which was formerly defined to be the higheſt exponent of the unknown quantity in any term of the equation.

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$$=x^3\left.\begin{array}{r}-a\\-b\\-c\end{array}\right\}+x^2\left.\begin{array}{r}+ab\\+ac\\+bc\end{array}\right\}\times x-abc=0,\ \text{a Cubic.}$$

$$\times x+m=0$$

$$=x^4\left.\begin{array}{r}-a\\-b\\-c\\+m\end{array}\right\}\times x^3\left.\begin{array}{r}+ab\\+ac\\+bc\\-am\\-bm\\-cm\end{array}\right\}\times x^2\left.\begin{array}{r}-abc\\+abm\\+acm\\+bcm\end{array}\right\}\times x-abcm=0,\ \text{a (Biquadratic.}$$

&c.

From this table it is plain,

1. That in a complete equation the number of terms is always greater by unit than the dimenſion of the equation.

2. The coefficient of the firſt term is 1.

The coefficient of the ſecond term is the ſum of all the roots (a, b, c, m, &c. with their ſigns changed.

The coefficient of the third term is the ſum of all the products that can be made by multiplying any two of the roots together.

The coefficient of the fourth term is the ſum of all the products which can be made by multiplying together any three of the roots with their ſigns changed; and ſo of others.

The laſt term is the product of all the roots, with their ſigns changed.

3. From induction it appears, that in any equation (the terms being regularly arranged as in the preceding example) there are as many poſitive roots as there are changes in the ſigns of the terms from + to —, and from — to +; and the remaining roots are negative. The rule alſo may be demonſtrated.

Note. The impoſſible roots in this rule are ſuppoſed to be either poſitive or negative.

In this example of a numeral equation $x^4-10x^3+35x-{}^250x+24=0$, the roots are, $+1$, $+2$, $+3$, $+4$, and the preceding obſervations with regard to the ſigns and coefficients take place.

Cor. If a term of an equation is wanting, the poſitive and negative parts of its coefficient muſt then be equal. If there is no abſolute term, then ſome of the roots muſt be $=0$, and the equation may be depreſſed by dividing all the terms by the loweſt power of the unknown quantity in any of them. In this caſe alſo, $x-0=0$, $x-0=0$, &c. may be conſidered as ſo many of the component ſimple equations, by which the given equation being divided, it will be depreſſed ſo many degrees.

CHAP. II.

Of the Transformation of Equations.

THERE are certain transformations of Equations neceſſary towards their ſolution; and the moſt uſeful are contained in the following propoſitions.

Prop. 1. The affirmative roots of an equation become negative, and the negative become affirmative, by changing the ſigns of the alternate terms, beginning with the ſecond.

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Thus the roots of the equation $x^4-x^3-19x^2+49x-30=0$ are $+1$, $+2$, $+3$, -5, whereas the roots of the equation $x^4+x^3-19x^2-49x-30=0$, are -1, -2, -3, $+5$.

The reaſon of this is derived from the compoſition of the coefficients of theſe terms, which conſiſt of combinations of odd numbers of the roots, as explained in the preceding Chapter.

Prop. 2. An equation may be transformed into another that ſhall have its roots greater or leſs than the roots of the given equation by ſome given difference.

Let x be the unknown quantity of the equation, and e the given difference; let $y=x\pm e$, then $x=y\pm e$; and if for x and its powers in the given equation, $y\pm e$ and its powers be inſerted, a new equation will ariſe, in which the unknown quantity is y, and its value will be $x\pm e$; that is, its roots will differ from the roots of the given equation by e.

Let the equation propoſed be $x^3-px^2+qx-r=0$, of which the roots muſt be diminiſhed by e. By inſerting for x and its powers $y+e$ and its powers, the equation required is,

$$\left.\begin{array}{r}y^3+3ey^2+3e^2y+e^3\\-py^2-2pey-pe^2\\+qy+qe\\-r\end{array}\right\}=0.$$

Cor. 1. From this transformation, the ſecond, or any other intermediate term, may be taken away; granting the reſolution of equations.

Since the coefficients of all the terms of the transformed equation, except the firſt, involve the powers of e and known quantities only, by putting the coefficient of any term equal to 0, and reſolving that equation, a value of e may be determined; which being ſubſtituted, will make that term to vaniſh.

Thus, in this example, to take away the ſecond term, let its coefficient, $3e-p=0$, and $e=\frac{1}{3}p$, which being ſubſtituted for e, the new equation will want the ſecond term. And univerſally, the coefficient of the firſt term of a cubic equation being 1, and x being the unknown quantity, the ſecond term may be taken away by ſuppoſing $x=y\pm\frac{1}{3}p$, $\pm p$ being the coefficient of that term.

Cor. 2. The ſecond term may be taken away by the ſolution of a ſimple equation, the third by the ſolution of a quadratic, and ſo on.

Cor. 3. If the ſecond term of a quadratic equation be taken away, it will become a pure equation, and thus a ſolution of quadratics will be obtained, which coincides with the ſolution already given in Part I.

Cor. 4. The laſt term of the transformed equation is the ſame with the given equation, only having e in place of x.

Prop. 3. In like manner may an equation be transformed into another, of which the roots ſhall be equal to the roots of the given equation, multiplied or divided by a given quantity.

Let x be the unknown letter in the given equation, and y that of the equation wanted; alſo let e be the given quantity.

To multiply the roots let $xe=y$, and $x=\frac{y}{e}$

To divide the roots let $\frac{x}{e}=y$, and $x=ye$.

Then ſubſtitute for x and its powers, $\frac{y}{e}$ or ye and its powers, and the new equation, of which y is the unknown quantity, will have the property required.

Cor. 1. By this propoſition an equation, in which the coefficient of the firſt term is any known quantity, as a, may be transformed into another, in which the coefficient of the firſt term ſhall be unit. Thus, let the equation be $ax^3—px^2+qx—r=0$. Suppoſe $y=ax$, or $x=\frac{y}{a}$, and for x and its powers inſert $\frac{y}{a}$ and its powers, and the equation becomes $\frac{y^3}{a^2}—\frac{py^2}{a^2}+\frac{qy}{a}—r=0$, or $y^3—py^2+qay—a^2r=0$. Alſo, let the equation be $5x^3—6x^2+7x—30=0$; and if $x=\frac{y}{5}$, then $y^3—6y^2+35y—750=0$.

Cor. 2. If the two transformations in Prop. 2. and 3. be both required, they may be performed either ſeparately or together.

Thus, if it is required to transform the equation $ax^3—px^2+qx—r=0$, into one which ſhall want the ſecond term, and in which the coefficient of the firſt term ſhall be 1; let $x=\frac{y}{a}$, and then $y^3—py^2+qay—a^2r=0$ as before; then let $y=z+\frac{1}{3}p$, and the new equation, of which z is the unknown quantity, will want the ſecond term, and the coefficient of z^3, the higheſt term is 1. Or, if $x=\frac{z+\frac{1}{3}p}{a}$, the ſame equation as the laſt found will ariſe from one operation.

Ex. Let the equation be $5x^3—6x^2+7x—30=0$. If $x=\frac{y}{5}$, then $y^3—6y^2+35y—750=0$. And if $y=z+2$, $z^3+23z—696=0$. Alſo, at once, let $x=\frac{z+2}{5}$, and the equation properly reduced, by bringing all the terms to a common denominator, and then caſting it off, will be $z^3+23z—696=0$, as before.

Cor. 3. If there are fractions in an equation, they may be taken away, by multiplying the equation by the denominators, and by this propoſition the equation may then be transformed into another, without fractions, in which the coefficient of the firſt term is 1. In like manner may a ſurd coefficient be taken away in certain caſes.

Cor. 4. Hence alſo, if the coefficient of the ſecond term of a cubic equation is not diviſible by 3, the fractions thence ariſing in the transformed equation, wanting the ſecond term, may be taken away by the preceding corollary. But the ſecond term alſo may be taken away, ſo that there ſhall be no ſuch fractions in the transformed equation, by ſuppoſing $x=\frac{z\pm p}{3}$, $\pm p$ being the coefficient of the ſecond term of the given equation. And if the equation $ax^3—px^2+qx—r=0$ be given, in which p is not diviſible by 3, by ſuppoſing $x=\frac{z+p}{3a}$, the transformed equation reduced is $z^3—3p^2+9aq.\times z—2p^3+9apq—27a^2r=0$; wanting the ſecond term, having 1 for the coefficient of the firſt term, and the coefficients of the other terms being all integers the coefficients of the given equation being alſo ſuppoſed integers.

General Corollary to Prop. 1. 2. 3.

If the roots of any of theſe transformed equations be found by any method, the roots of the original equation, from which they were derived, will eaſily be found from the ſimple equations expreſſing their relation. Thus, if 8 is found to be a root of the transformed equation $z^3+23z—696=0$ (Cor. 2. prop. 3.) Since $x=\frac{z+2}{5}$, the correſponding root of the given equation $5x^3—6x^2+7x—30=0$ muſt be $\frac{8+2}{5}=2$. It is to be obſerved alſo, that the reaſoning in Prop. 2. and 3. and the corollaries, may be extended to any order of equations, though in them it is applied chiefly to cubics.

CHAP. III.

Of the Reſolution of Equations.

From the preceding principles and operations, rules may be derived for reſolving equations of all orders.

I. Cardan's *Rule for Cubic Equations.*

The ſecond term of a cubic equation being taken away, and the coefficient of the firſt term being made 1, (by Cor. 1. Prop. 2. and Cor. 1. Prop. 3. Chap. II.) it may be generally repreſented by $x^3 {}_* +3qx+2r=0$; the ſign + in all terms denoting the addition of them, with their proper ſigns. Let $x=m+n$, and alſo $mn=—q$; by the ſubſtitution of theſe values, an equation of the 6th order, but of the quadratic form, is deduced, which gives the values of m and n; and hence,

$$\begin{gathered}(m+n=)\ x=\sqrt[3]{—r+\sqrt{r^2+q^3}}+\sqrt[3]{—r—\sqrt{r^2+q^3}};\\ q\end{gathered}$$

$$\text{or } x=\sqrt[3]{—r+\sqrt{r^2+q^3}}—\sqrt[3]{—r+\sqrt{r^2+q^3}}.$$

Cor. 1. In the given equation, if $3q$ is negative, and if r^2 is leſs than q^3, this expreſſion of the root involves impoſſible roots; while, at the ſame time, all the roots of that equation are poſſible. The reaſon is, that in this method of ſolution it is neceſſary to ſuppoſe that x the root may be divided into two parts, of which the product is q. But it is eaſy to ſhow, that in this, which is called the *irreducible caſe*, it cannot be done.

For example, the equation (Ex. 3. Sect. 3. of this Chapter), $x^3—156x+560=0$, belongs to the irreducible caſe, and the three roots are +4, +10, —14; and it is plain that none of theſe roots can be divided into two parts (m and n), of which the product can be equal to $(—q=)\frac{156}{3}=52$; for the greateſt product from the diviſion of the greateſt root —14, is $—7\times—7=49$ leſs than 52.

If the cube root of the compound ſurd can be extracted, the impoſſible parts balance each other, and the true root is obtained.

The geometrical problem of the triſection of an arch is reſolved algebraically, by a cubic equation of this form; and hence the foundation of the rule for reſolving an equation belonging to this caſe, by a table of ſines.

Cor. 2. Biquadratic equations may be reduced to cubics, and may therefore be reſolved by this rule.

Some other claſſes of equations, too, may be reſolved by particular rules, but theſe, and every other order of equations, are commonly reſolved by the general rules, which may be equally applied to all.

II. *Solution of Equations, whoſe Roots are commenſurate.*

Rule 1. All the terms of the equation being brought to one ſide, find all the diviſors of the abſolute term, and ſubſtitute them ſucceſſively in the equation for the unknown quantity. That diviſor which, ſubſtituted in this manner, gives the reſult $=0$, ſhall be a root of the equation.

Ex. 1. $\left.\begin{matrix} x^3-3ax^2+2a^2x-2a^2b \\ -bx^2+3abx \end{matrix}\right\}=0.$

The ſimple literal diviſors of $-2a^2b$ are a, b, $2a$, $2b$, any of which may be inſerted for x. Suppoſing $x=+a$, the equation becomes

$\left.\begin{matrix} a^3-3a^3+2a^3-2a^2b \\ -ba^2+3a^2b \end{matrix}\right\}$ which is obviouſly $=0$.

Ex. 2. $x^3-2x^2-33x+90=0$.

The diviſors of 90 are 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90.

The firſt of theſe diviſors, which being inſerted for x will make the reſult $=0$, is $+3$; $+5$ is another; and it is plain the laſt root muſt be negative, and it is -6.

When 3 is diſcovered to be a root, the given equation may be divided by $x-3=0$, and the reſult will be a quadratic, which being reſolved will give the other two roots, $+5$ and -6.

The reaſon of the rule appears from the property of the abſolute term formerly defined, viz. that it is the product of all the roots.

To avoid the inconvenience of trying many diviſors, this method is ſhortened by the following

Rule 2. Subſtitute in place of the unknown quantity ſucceſſively three or more terms of the progreſſion, 1, 0, -1, &c. and find all the diviſors of the ſums that reſult; then take out all the arithmetical progreſſions that can be found among theſe diviſors whoſe common difference is 1, and the values of x will be among thoſe terms of the progreſſions which are the diviſors of the reſult ariſing from the ſubſtitution of $x=0$. When the ſeries increaſes, the roots will be negative.

Examp. Let it be required to find a root of the equation $x^3-x^2-10x+6=0$.

The operation is thus;

Suppoſit.		*Reſult.*	*Diviſors.*	*Ar. pro.*
$x=1$	$x^3-x^2\ 10x+6=$	-4	1, 2, 4,	4
$x=0$		$+6$	1, 2, 3, 6,	3
$x=-1$		$+14$	1, 2, 7, 14,	2

In this example there is only one progreſſion, 4, 3, 2; and therefore 3 is a root, and it is -3, ſince the ſeries decreaſes.

It is evident by the rules for tranſforming equations (Chap. II.), that by inſerting for x, $+1$ $(=+e)$ the reſult is the abſolute term of an equation of which the roots are leſs than the roots of the given equation by 1 $(=e)$. Cor. 4. Prop. 2. When $x=0$, the reſult is the abſolute term of the given equation. When for x is inſerted -1 $(=-e)$ the reſult is the abſolute term of an equation whoſe roots exceed the roots of the given equation by 1 $(=e)$. Hence, if the terms of the ſeries 1, 0, -1, -2, &c. be inſerted ſucceſſively for x, the reſults will be the abſolute terms of ſo many equations, of which the roots form an increaſing arithmetical ſeries with the difference 1. But as the commenſurate roots of theſe equations muſt be among the diviſors of their abſolute terms, hence they muſt be among the arithmetical progreſſions found by this rule. The roots of the given equation, therefore, are to be ſought for among the terms of theſe progreſſions which are diviſors of the reſult, upon the ſuppoſition of $x=0$, becauſe that reſult is its abſolute term.

It is plain that the progreſſions muſt always be increaſing, only it is to be obſerved, that a decreaſing ſeries with the ſign + becomes increaſing with the ſign —. Thus, in the preceding example, -4, -3, -2, is an increaſing ſeries, of which -3 is to be tried, and it ſucceeds.

If, from the ſubſtitution of three terms of the progreſſion, 1, 0, -1, &c. there ariſe a number of arithmetical ſerieſes, by ſubſtituting more terms of that progreſſion, ſome of the ſerieſes will break off, and, of courſe, fewer trials will be neceſſary.

III. *Examples of Queſtions producing the higher Equations.*

Examp. 1. It is required to divide 16l. between two perſons, ſo that the cube of the one's ſhare may exceed the cube of the other's by 386.

Let the greater ſhare be x pounds,
And the leſs will be $16-x$;

By the queſtion, $x^3-\overline{16-x}|^3=386$

And by Inv. $2x^3-48x^2+768x-4096=386$

Tranſp. and divide $x^3-24x^2+384x-2241=0$.

Suppoſ.	*Reſults.*	*Diviſors.*
If $x=1$;	1880	1, 2, 4, 5, 8, 10, 20,
$x=0$;	2241	1, 3, 9, 27, 83,
$x=-1$;	2650	1, 2, 5, 10, 25, 53.

Where 8, 9, 10, differ by 1; therefore +9 is to be tried; and being inſerted for x, the equation is $=0$. The two ſhares then are 9 and 7 which ſucceed.

Since

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Since $x=9$; $x-9=0$, is one of the ſimple equations from which this cubic is produced, therefore $\frac{x^3-24x^2+384x-2241}{x-9}=x^2-15x+249=0$. And the two roots of this quadratic are impoſſible.

Examp. 2. What two numbers are thoſe whoſe product multiplied by the greater will produce 405, and their difference multiplied by the leſs 20?

Let the greater number be x, and the leſs y.

Then by queſt. $\left\{\begin{array}{l}(\overline{xy}\times x=)x^2y=405 \\ (\overline{x-y}\times y=)xy-y^2=20\end{array}\right.$

Therefore - - - $x=\frac{y^2+20}{y}$

And - - - - $x^2=\frac{y^4+40y^2+400}{y^2}$

Alſo - - - - $x^2=\frac{405}{y}$

Therefore $\frac{y^4+40y^2+400}{y^2}=\frac{405}{y}$

Mult. and tranſp. $y^4+40y^2-405y+400=0$.

This biquadratic, reſolved by diviſors, gives $y=5$: and therefore $x=9$. Alſo $\frac{y^4+40y^2-405y+400}{y-5}=y^3+5y^2+65y-80=0$.

This cubic equation has one poſitive incommenſurate root, viz. 1.114, &c. which may be found by the rule in the next ſection, and two impoſſibles. The incommenſurate root $y=1.114$, &c. gives $x=19.067$, &c. and theſe two anſwer the conditions very nearly.

Examp. 3. The ſum of the ſquares of two numbers 208, and the ſum of their cubes 2240 being given, to find them.

Let the greater be $x+y$, and the leſs $x-y$.

Then $\overline{x+y}|^2+\overline{x-y}|^2=2x^2+2y^2=208$

Hence $y^2=104-x^2$

Alſo $\overline{x+y}|^3+\overline{x-y}|^3=2x^3+6xy^2=2240$

Subſtitute for y^2 its value and $2x^3+624x-6x^3=2240$.

This reduced gives $x^3-156x+560=0$.

The roots of this equation are $+10$ $+14$, -14. If $x=10$, then $y=2$; and the numbers ſought are 12 and 8, which give the only juſt ſolution. If $x=4$, then $y^2=88$ and $y=\sqrt{88}$. The numbers ſought are therefore $4+\sqrt{88}$ and $4-\sqrt{88}$. The laſt is negative, but they anſwer the conditions. Laſtly, if $x=-14$, then $y^2=-92$, hence $y=\sqrt{-92}$, is impoſſible; but ſtill the two numbers $-14+\sqrt{-92}$, $-14-\sqrt{-92}$, being inſerted, would anſwer the conditions. But it has been frequently obſerved, that ſuch ſolutions are both uſeleſs and without meaning.

IV. *Solution of Equations by Approximation.*

By the former rules, the roots of equations, when they are commenſurate, may be obtained. Theſe, however, more rarely occur; and when they are incommenſurate, we can only find an approximate value of them, but to any degree of exactneſs required. There are various rules for this purpoſe; one of the moſt ſimple is that of Sir Iſaac Newton, which ſhall be now explained.

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Lemma. If any two numbers, being inſerted for the unknown quantity (x) in any equation, give reſults with oppoſite ſigns, an odd number of roots muſt be between theſe numbers.

This appears from the property of the abſolute term, and from this obvious maxim, that if a number of quantities be multiplied together, and if the ſigns of an odd number of them be changed, the ſign of the product is changed. For, when a poſitive quantity is inſerted for x, the reſult is the abſolute term of an equation whoſe roots are leſs than the roots of the given equation by that quantity (Prop. 2. Cor. 3. Chap. II.) If the reſult has the ſame ſign as the given abſolute term, then from the property of the abſolute term (Prop. 2. Chap. I.) either none or an even number only of the poſitive roots, have had their ſigns changed by the transformation; but if the reſult has an oppoſite ſign to that of the given abſolute term, the ſigns of an odd number of the poſitive roots muſt have been changed. In the firſt caſe, then, the quantity ſubſtituted muſt have been either greater than each of an even number of the poſitive roots of the given equation, or leſs than any of them; in the ſecond caſe, it muſt have been greater than each of an odd number of the poſitive roots. An odd number of the poſitive roots, therefore, muſt lie between them when they give reſults with oppoſite ſigns. The ſame obſervation is to be extended to the ſubſtitution of negative quantities and the negative roots.

From this lemma, by means of trials, it will not be difficult to find the neareſt integer to a root of a given numeral equation. This is the firſt ſtep towards the approximation; and both the manner of continuing it, and the reaſon of the operation, will be evident from the following example.

Let the equation be $x^3-2x-5=0$.

1. Find the neareſt integer to the root. In this caſe a root is between 2 and 3; for theſe numbers being inſerted for x, the one gives a poſitive, and the other a negative, reſult. Either the number above the root, or that below it, may be aſſumed as the firſt value; only it will be more convenient to take that which appears to be neareſt to the root, as will be manifeſt from the nature of the operation.

2. Suppoſe $x=2+f$, and ſubſtitute this value of x in the equation.

$$\begin{array}{rl} x^3 = & 8+12f+6ff+f^3. \\ -2x = & -4-2f \\ -5 = & -5 \\ \hline x^3-2x-f = & -1+10f+6f^2+f^3=0. \end{array}$$

As f is leſs than unit, its powers f^2 and f^3 may be neglected in this firſt approximation, and $10f=1$, or $f=0.1$ nearly, therefore $x=2.1$ nearly.

3. As $f=0.1$ nearly, let $f=.1+g$, and inſert this value of f in the preceding equation.

$$\begin{array}{rl} f^3 = & 0.001+0.03g+0.3g^2+g^3 \\ 6f^2 = & 0.06+1.2g+6g^2 \\ 10f = & 1+10g \\ -1 = & -1 \\ \hline f^3+6f^2+10f-1 = & 0.061+11.23g+6.3g^2+g^3=0 \end{array}$$

and neglecting g^2 and g^3 as very ſmall $0.61+1123g=0$,

$=0$, or $g=\frac{-0.061}{11.23}=-.0054$, hence $f=0.1+g=.0946$ nearly, and $x=2.0946$ nearly.

4. This operation may be continued to any length, as by ſuppoſing $g=-.0054+h$, and ſo on, and the value of $x=2.09455147$ nearly.

By the firſt operation a nearer value of x may be found thus; ſince $f=.1$ nearly and $-1+10f+6f^2+f_3=0$, $f=\frac{1}{10+6f+f^2}$, that is, $f=\frac{1}{10+.6+.01}=,094$ true to the laſt figure, and $x=2.094$.

In the ſame manner may the root of a pure equation be found, and this gives an eaſy method of approximating to the roots of numbers which are not perfect powers.

This rule is applicable to numeral equations of every order; and, by aſſuming a general equation, general rules may be deduced for approximating to the roots of any propoſed equation. By a ſimilar method we may approximate to the roots of literal equations, which will be expreſſed by infinite ſeries.

PART III.

Of the Application of ALGEBRA to GEOMETRY.

CHAP. I.

General Principles.

GEOMETRY treats both of the magnitude and poſition of extenſion, and their connections.

Algebra treats only of magnitude; therefore, of the relations which ſubſiſt in geometrical figures, thoſe of magnitude only can be immediately expreſſed by algebra.

The oppoſite poſition of ſtraight lines may indeed be expreſſed ſimply by the ſigns + and —. But, in order to expreſs the various other poſitions of geometrical figures by algebra from the principles of geometry, ſome relations of magnitude muſt be found, which depend upon theſe poſitions, and which can be exhibited by equations: And, converſely, by the ſame principles may the poſitions of figures be inferred from the equations denoting ſuch relations of their parts.

Though this application of algebra appears to be indirect, yet ſuch is the ſimplicity of the operations, and the general nature of its theorems, that inveſtigations, eſpecially in the higher parts of geometry, are, generally eaſier and more expeditious by the algebraical method, though leſs elegant, than by what is purely geometrical. The connections alſo, and analogies of the two ſciences eſtabliſhed by this application, have given riſe to many curious ſpeculations. Geometry has been rendered far more extenſive and uſeful, and algebra itſelf has received conſiderable improvements.

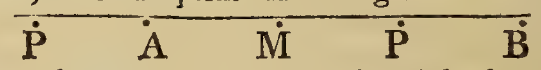
I. *Of the Algebraical Expreſſion of Geometrical Magnitudes.*

A *line*, whether known or unknown, is repreſented by a ſingle letter: a *rectangle* is properly expreſſed by the product of the two letters repreſenting its ſides: and a *rectangular parallelopiped* by the product of three letters; two of which repreſent the ſides of any of its rectangular baſes, and the third the altitude.

Theſe are the moſt ſimple expreſſions of geometrical magnitudes; and any other which has a known proportion to theſe, may in like manner be expreſſed algebraically. Converſely, the geometrical magnitudes, repreſented by ſuch algebraical quantities, may be found, only the algebraical dimenſions above the third, not having any correſponding geometrical dimenſions, muſt be expreſſed by proportionals (A).

The oppoſite poſition of ſtraight lines, it has been remarked, may be expreſſed by the ſigns + and —.

Thus, let a point A be given in the line



AP, any ſegment AP taken to the right hand being conſidered as poſitive, a ſegment Ap to the left is properly

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(A) All algebraical dimenſions above the third muſt be expreſſed by inferior geometrical dimenſions; and though any algebraical quantities of two or three dimenſions may be immediately expreſſed by ſurfaces and ſolids reſpectively, yet it is generally neceſſary to expreſs them, and all ſuperior dimenſions, by lines.

If, in any geometrical inveſtigation by algebra, each line is expreſſed by a ſingle letter, and each ſurface or ſolid by an algebraical quantity of two or three dimenſions reſpectively, then whatever legitimate operations are performed with regard to them, the terms in any equation derived will, when properly reduced, be all of the ſame dimenſion; and any ſuch equation may be eaſily expreſſed geometrically by means of proportionals, as in the following example.

Thus, if the algebraical equation $a^4+b^4=c^4-d^4$, is to be expreſſed geometrically, a, b, c, and d, being ſuppoſed to repreſent ſtraight lines; let $a:b:e:f:g$, in continual proportion, then $a^4:b^4::a:g$ and $a^4:a^4+b^4::a:a+g$; then let $a:c:h:k:l$, and $a^4:c^4::a:l$; alſo, let $c:d:m:n:p$, and $c^4:d^4::c:p$, or $c^4:c^4-d^4::c:c-p$. By combining the two former proportions (Chap. II. Part I.), $c^4:a^4+b^4::l:a+g$, and combining the latter with this laſt found, $c^4-d^4:a^4+b^4::\overline{c-p}\times l:c\times\overline{a+g}$; therefore $\overline{c-p}\times l=c\times\overline{a+g}$, and $c:c-p::l:a+g$.

If

perly repreſented by a negative quantity. If a and b repreſent two lines; and if, upon the line AB from the point A, AP be taken towards the right equal to a, it may be expreſſed by $+a$; then PM taken to the left and equal to b, will be properly repreſented by $-b$, for AM is equal to $a-b$. If $a=b$, then M will fall upon A, and $a-b=0$. By the ſame notation, if b is greater than a, M will fall to the left of A; and in this caſe, if $2a=b$, and if Pp be taken equal to b, then $(a-b=)-a$ will repreſent Ap, which is equal to a, and ſituated to the left of A. This uſe of the ſigns, however, in particular caſes, may be precluded, or in ſome meaſure reſtrained.

The poſitions of geometrical figures are ſo various, that it is impoſſible to give general rules for the algebraical expreſſion of them. The following are a few examples.

An angle is expreſſed by the ratio of its ſine to the radius; a right angle in a triangle, by putting the ſquares of the two ſides equal to the ſquare of the hypothenuſe; the poſition of points is aſcertained by the perpendiculars from them on lines given in poſition; the poſition of lines by the angles which they make with given lines, or by the perpendiculars on them from given points; the ſimilarity of triangles by the proportionality of their ſides which gives an equation, &c.

Theſe and other geometrical principles muſt be employed both in the demonſtration of theorems and in the ſolution of problems. The geometrical propoſition muſt firſt be expreſſed in the algebraical manner, and the reſult after the operation muſt be expreſſed geometrically.

II. *The Demonſtration of Theorems.*

All propoſitions in which the proportions of magnitudes only are employed, alſo all propoſitions expreſſing the relations of the ſegments of a ſtraight line, of their ſquares, rectangles, cubes, and parallelopipeds, are demonſtrated algebraically with great eaſe. Such demonſtrations, indeed, may in general be conſidered as an abridged notation of what are purely geometrical.

This is patricularly the caſe in thoſe propoſitions which may be geometrically deduced without any conſtruction of the ſquares, rectangles, &c. to which they refer. From the firſt propoſition of the ſecond book of Euclid, the nine following may be eaſily derived in this manner, and they may be conſidered as proper examples of this moſt obvious application of algebra to geometry.

If certain poſitions are either ſuppoſed or to be inferred in a theorem, we muſt find, according to the preceding obſervations, the connection between theſe poſitions and ſuch relations of magnitude as can be expreſſed and reaſoned upon by algebra. The algebraical demonſtrations of the 12th and 13th propoſitions of the 2d book of Euclid, requires only the 47th of the I. El. The 35th and 36th of the 3d book require only the 3. III. El. and 47. I. El.

From a few ſimple geometrical principles alone, a number of concluſions, with regard to figures, may be deduced by algebra; and to this in a great meaſure is owing the extenſive uſe of this ſcience in geometry. If other more remote geometrical principles are occaſionally introduced, the algebraical calculations may be much abridged. The ſame is to be obſerved in the ſolution of problems; but ſuch in general are leſs obvious, and more properly belong to the ſtrict geometrical method.

III. *Of the Solution of Problems.*

Upon the ſame principles are geometrical problems to be reſolved. The problem is ſuppoſed to be conſtructed, and proper algebraical notations of the known and unknown magnitudes are to be ſought for, by means of which their connections may be expreſſed by equations. It may firſt be remarked, as was done in the caſe of theorems, that in thoſe problems which relate to the diviſions of a line and the proportions of its parts, the expreſſion of the quantities, and the ſtating their relations by equations, are ſo eaſy as not to require any particular directions. But when various poſitions of geometrical figures and their properties are introduced, the ſolution requires more attention and ſkill. No general rules can be given on this ſubject, but the following obſervations may be of uſe.

1. The conſtruction of the problem being ſuppoſed, it is often farther neceſſary to produce ſome of the lines till they meet; to draw new lines joining remarkable points; to draw lines from ſuch points perpendicular or parallel to other lines, and ſuch other operations as ſeem conducive to the finding of equations; and for this purpoſe, thoſe eſpecially are to be employed which divide the ſcheme into triangles that are given, right angled or ſimilar.

2. It is often convenient to denote by letters, not the quantities particularly ſought, but ſome others from which they can eaſily be deduced. The ſame may be obſerved of given quantities.

3. The proper notation being made, the neceſſary equations are to be derived by the uſe of the moſt ſimple geometrical principles; ſuch as the addition and ſubſtraction of lines or of ſquares, the proportionality of lines, particularly of the ſides of ſimilar triangles, &c.

4. There muſt be as many independent equations as there are unknown quantities aſſumed in the inveſtigation, and from theſe a final equation may be inferred by the Rules of Part I.

If the final equation from the problem be reſolved, the roots may often be exhibited geometrically; but the geometrical conſtruction of problems may be ef-

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If any known line is aſſumed as 1, as its powers do not appear, the terms of an equation, including any of them, may be of very different dimenſions; and before it can be properly expreſſed by geometrical magnitudes, the deficient dimenſions muſt be ſupplied by powers of the 1. When an equation has been derived from geometrical relations, the line denoting 1 is known; and when an aſſumed equation is to be expreſſed by the relations of geometrical magnitudes, the 1 is to be aſſumed.

In this manner may any ſingle power be expreſſed by a line. If it is x^5, then to 1, x find four quantities in continued proportion; ſo that $1 : x : m : n : p : q$, then $1 : q :: 1^5 : x^5$, or $q=x^5$; and ſo of others.

Application to Geometry.

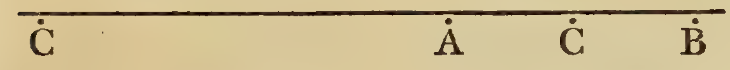
fected alſo without reſolving the equation, and even without deducing a final equation, by the methods afterwards to be explained.

If the final equation is ſimple or quadratic, the roots being obtained by the common rules, may be geometrically exhibited by the finding of proportionals, and the addition or ſubtraction of ſquares.

By inſerting numbers for the known quantities, a numeral expreſſion of the quantities ſought will be obtained by reſolving the equation. But in order to determine ſome particulars of the problem beſides finding the unknown quantities of the equation, it may be farther neceſſary to make a ſimple conſtruction; or, if it is required that every thing be expreſſed in numbers, to ſubſtitute a new calculation in place of that conſtruction.

Prop. I. *To divide a given ſtraight line* AB *into two parts, ſo that the rectangle contained by the whole line and one of the parts may be equal to the ſquare of the other part.*

This is prop. 11th II. B. of Eucl.



Let C be the point of diviſion, and let $AB = a$, $AC = x$, and then $CB = a - x$. From the problem $a^2 - ax = x^2$; and this equation being reſolved (Chap. V. P. II.) gives $x = \pm\sqrt{a^2 + \frac{a^2}{4}} - \frac{a}{2}$

The quantity $\sqrt{\frac{a^2}{4} + a^2}$, is the hypothenuſe of a right-angled triangle, of which the two ſides are a and $\frac{a}{2}$, and is therefore eaſily found; $\frac{a}{2}$ being taken from this line, gives $x = AC$, which is the proper ſolution. But if a line AC be taken on the oppoſite ſide of A, and equal to the above-mentioned hypothenuſe, together with $\frac{a}{2}$, it will repreſent the negative root $-\sqrt{a^2 + \frac{a^2}{4}} - \frac{a}{2}$, and will give another ſolution; for in this caſe alſo $AB \times BC = AC^2$. But C is without the line AB; and therefore, if it is not conſidered as making a diviſion of AB, this negative root is rejected.

This ſolution coincides with what is given by Euclid. For $\sqrt{a^2 + \frac{a^2}{4}}$ is equal (ſee the fig. of Prop. 11th II. B. Eucl. Simſon's edit.) to EB or EF, and therefore $x = \sqrt{a^2 + \frac{a^2}{4}} - \frac{a}{2} = EF - EA = AF = AH$; and the point H correſponds to C in the preceding figure.

Beſides, if on $(EF + EA =)$ CF (inſtead of $EF - EA = FA$) a ſquare be deſcribed on the oppoſite ſide of CF from AG, BA produced will meet a ſide of it in a point; which, if it be called K, will give $KB \times BA = KA^2$. K correſponds to C, and this ſolution will correſpond with the algebraical ſolution by means of the negative root.

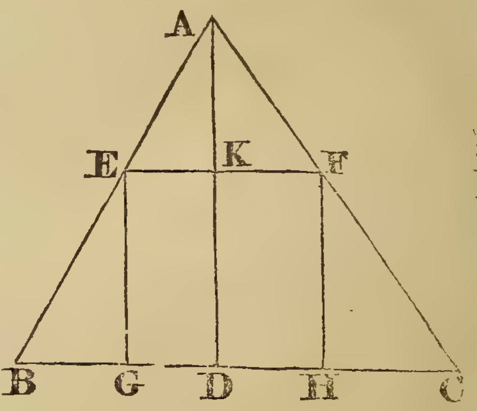
If CB had been called x, and $AC = a - x$, the equation would be $ax = a^2 - 2ax + x^2$, which gives $x = \frac{3a \pm \sqrt{5a^2}}{2}$, in which both roots are poſitive, and the ſolutions derived from them coincide with the preceding. If the ſolution be confined to a point within the line, then one of theſe poſitive roots muſt be rejected, for one of the roots of the compound ſquare from which it is derived, $x - \frac{3a}{2}$, a negative quantity, which in this ſtrict hypotheſis is not admitted. In ſuch a problem, however, both conſtructions are generally received, and conſidered even as neceſſary to a complete ſolution of it.

Application to Geometry.

If a ſolution in numbers be required, let $AB = 10$, then $x = \pm\sqrt{125} - 5$. It is plain, whatever be the value of AB, the roots of this equation are incommenſurate, though they may be found, by approximation, to any degree of exactneſs required. In this caſe, $x = \pm 11.1803 - 5$, nearly; that is $AC = 6.1803$, nearly; and $AC = 16.1803$, nearly.

Prob. II. *In a given Triangle* ABC *to inſcribe a ſquare.*

Suppoſe it to be done, and let it be EFHG. From A let AD be perpendicular on the baſe BC, meeting EF in K.

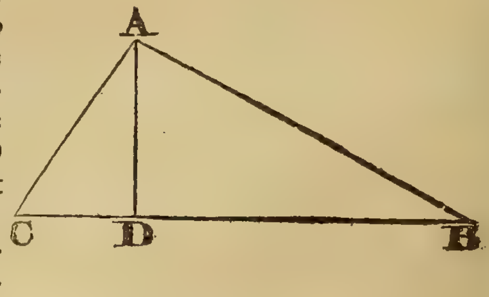


Let $BC = a$, and $AD = p$, both of which are given becauſe the triangle is given. Let AK be aſſumed as the unknown quantity, becauſe from it the ſquare can eaſily be conſtructed; and let it be called x. Then $(KD = EG =)$ $EF = p - x$.

On account of the parallels EF, BC, $AD : BC :: AK : EF$; that is, $p : a :: x : p - x$, and $p^2 - px = ax$, which equation being reſolved, gives $x = \frac{p^2}{p + a}$.

Therefore x or AK is a third proportional to $p + a$ and p, and may be found by 11. VI. El. The point K being found, the conſtruction of the ſquare is ſufficiently obvious.

Prob. III. *In the right-angled Triangle* ABC, *the Baſe* BC, *and the Sum of the Perpendicular and Sides* BA+AC+AD *being given, to find the Triangle.*



Such parts of this triangle are to be found as are neceſſary for deſcribing it: The perpendicular AD will be ſufficient for this purpoſe; and let it be called x: Let $AB + AC + AD = a$, $BC = b$; therefore $BA + AC = a - x$

Let

Applicati-
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netry.

Let BA—AB be denoted by y, then $BA=\frac{a+y-x}{2}$, and $AC=\frac{a-x-y}{2}$. But [47. I. El.] $BC^2=BA^2+AC^2$, which being expreſſed algebraically, becomes $b^2=\overline{\frac{a+y-x}{2}}\Big|^2+\overline{\frac{a-x-y}{2}}\Big|^2=\frac{a^2-2ax+x^2+y^2}{2}$. Likewiſe from a known property of right-angled triangles, $BC\times AD=BA\times AC$; that is, $bx=\left(\frac{a+y-x}{2}\times\frac{a-y-x}{2}=\right)\frac{a^2-2ax+x^2-y^2}{4}$. This laſt equation being multiplied by 2, and added to the former, gives $b^2+2bx=a^2-2ax+x^2$, which being reſolved according to the rules of Part I. Chap. V. gives $x=a+b-\sqrt{2ab+2b^2}$.

To conſtruct this: $a+b$ is the ſum of the perimeter and perpendicular, and is given; $\sqrt{2ab+2b^2}=\sqrt{\overline{a+b}\times 2b}$ is a mean proportional between $a+b$ and $2b$, and may be found; therefore, from the ſum of the perimeter and perpendicular ſubtract the mean propoportional between the ſaid ſum and double the baſe, and the remainder will be the perpendicular required.

From the baſe and perpendicular the right-angled triangle is eaſily conſtructed.

In numbers, let $BA+AC+AD=18.8=a$; $BC=10=b$; then $AD=a+b-\sqrt{2ab+b^2}=28.8-\sqrt{576}=4.8=x$, and $BA+AC=14$. By either of the firſt equations $y^2=2b^2+2ax-a^2-x^2=4$ and $y=BA-AC=2$; therefore $BA=8$, and $AC=6$.

The geometrical expreſſion of the roots of final equations ariſing from problems may be found without reſolving them by the interſection of geometrical lines. Thus, the roots of a quadratic are found by the interſections of the circle and ſtraight line, thoſe of a cubic and biquadratic, by the interſections of two conic ſections, &c.

The ſolution of problems may be effected alſo by the interſections of the *loci* of two intermediate equations without deducing a final equation. But theſe two laſt methods can only be underſtood by the doctrine of the *loci* of equations.

CHAP. II.

Of the Definition of Lines by Equations.

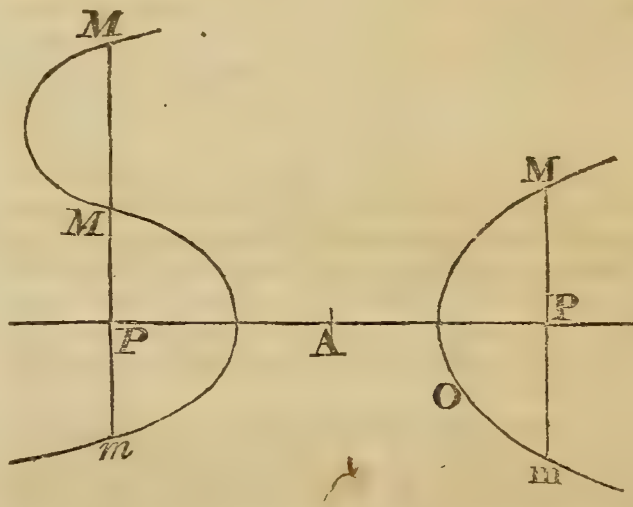
LINES which can be mathematically treated of muſt be produced according to an uniform rule which determines the poſition of every point of them.

This rule conſtitutes the *definition* of any line from which all its other properties are to be derived.

A ſtraight line has been conſidered as ſo ſimple as to be incapable of definition. The curve lines here treated of are ſuppoſed to be in a plane; and are defined either from the ſection of a ſolid by a plane, or more univerſally by ſome continued motion in a plane, according to particular rules. Any of the properties which are ſhown to belong peculiarly to ſuch a line, may be aſſumed alſo as the definition of it, from which all the others, and even what upon other occaſions may have been conſidered as the primary definition, may be demonſtrated. Hence lines may be defined in various methods, of which the moſt convenient is to be determined by the purpoſe in view. The ſimplicity of a definition, and the eaſe with which the other properties can be derived from it, generally give a preference.

Application to Geometry.

Definitions. 1. When curve lines are defined by equations, they are ſuppoſed to be produced by the extremity of one ſtraight line, as PM moving in a given angle along another ſtraight line AB given in poſition, which is called the baſe.



2. The ſtraight line PM moving along the other, is called an *Ordinate*, and is uſually denoted by y.

3. The ſegment of the baſe AP between a given point in it A, and an ordinate PM, is called an *Abſciſs* with reſpect to that ordinate, and is denoted by x. The ordinate and abſciſs together are called *Co-ordinates*.

4. If the relation of the variable abſciſs and ordinate AP and PM, be expreſſed by an equation, which beſides x and y contains only known quantities, the curve MO deſcribed by the extremity of the ordinate moving along the baſe, is called the *Locus* of that equation.

5. If the equation is finite, the curve is called *Algebraical* (A). It is this claſs only which is here conſidered.

6. The *dimenſions* of ſuch equations are eſtimated from the higheſt ſum of the exponents of x and y in any term.—According to this definition, the terms $x^4, x^3y, x^2y^2, xy^3, y^4$ are all of the ſame dimenſion.

7. Curve lines are divided into *orders* from the dimenſions of their equations, when freed from fractions and ſurds.

In theſe general definitions, the ſtraight line is ſuppoſed to be comprehended, as it is the locus of ſimple equations. The loci of quadratic equations are ſhown to

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(A) The terms *Geometrical* and *Algebraical*, as applied to curve lines, are uſed in different ſenſes by different writers; there are ſeveral other claſſes of curves beſides what is here called algebraical, which can be treated of mathematically, and even by means of algebra. See Scholium at the end.

to be the conic ſections, which are hence called lines of the ſecond order, &c.

It is ſufficiently plain from the nature of an equation, containing two variable quantities, that it muſt determine the poſition of every point of the curve, defined by it in the manner now deſcribed: for if any particular known value of one of the variable quantities as x be aſſumed, the equation will then have one unknown quantity only, and being reſolved, will give a preciſe number of correſponding values of y, which determine ſo many points of the curve.

As every point of the locus of an equation has the ſame general property, it muſt be one curve only, and from this equation all its properties may be derived. It is plain alſo, that any curve line defined from the motion of a point, according to a fixed rule, muſt either return into itſelf, or be extended *ad infinitum* with a continued curvature.

The equation, however, is ſuppoſed to be irreducible; becauſe, if it is not, the locus will be a combination of inferior lines: but this combination will poſſeſs the general properties of the lines of the order of the given equation.

It is to be obſerved all along, that the poſitive values of the ordinate, as PM, being taken upwards, the negative Pm will be placed downwards, on the oppoſite ſide of the baſe: and if poſitive values of the abſciſs, as AP, be aſſumed to the right from its beginning, the negative values, *AP* will be upon the left, and from theſe the points of the curve *M*, *m*, on that ſide are to be determined.

In the general definition of curves it is uſual to ſuppoſe the co-ordinates to be at right angles. If the locus of any equation be deſcribed, and if the abſciſs be aſſumed on another baſe, and the ordinate be placed at a different angle, the new equation expreſſing their relation, though of a different form, will be of the ſame order as the original equation; and likewiſe will have, in common with it, thoſe properties which diſtinguiſh the equations of that particular curve.

This method of defining curves by equations may not be the fitteſt for a full inveſtigation of the properties of a particular curve; but as their number is without limit, ſuch a minute enquiry concerning all, would be not only uſeleſs, but impoſſible. It has this great advantage, however, that many of the general affections of all curves, and of the diſtinct orders, and alſo ſome of the moſt uſeful properties of particular curves, may be eaſily derived from it.

I. *The Determination of the Figure of a Curve from its Equation.*

The general figure of the curve may be found by ſubſtituting ſucceſſively particular values of x the abſciſs, and finding by the reſolution of theſe equations the correſponding values of y the ordinate, and of conſequence ſo many points of the curve. If numeral values be ſubſtituted for x, and alſo certain numbers for the known letters, the reſolution of the equation gives numeral expreſſions of the ordinates; and from theſe, by means of ſcales, a mechanical deſcription of the curve will be obtained, which may often be uſeful, both in pointing out the general diſpoſition of the figure, and alſo in the practical applications of geometry.

Some more general ſuppoſitions may be of uſe in determining the figure; but theſe can be ſuggeſted only from the particular form of the equation in view. By ſuppoſing x to have certain relations to the known quantities, the values of y may become more ſimple, and the equation may be reduced to ſuch a form as to ſhow the direction of the curve, and ſome of its obvious properties.

The following general obſervations may alſo be laid down:

1. If in any caſe a value of y vaniſhes, then the curve meets the baſe in a point determined by the correſponding value of x. Hence by putting $y=0$, the roots of the equation, which in that ſituation are values of x, will give the diſtances on the baſe from the point aſſumed as the beginning of x, at which the curve meets it.

2. If at a particular value of x, y becomes infinite, the curve has an infinite arc, and the ordinate at that point becomes an aſymptote.

3. If when x becomes infinitely great, y vaniſhes, the baſe becomes an aſymptote.

4. If any value of y becomes impoſſible, then ſo many interſections of the ordinate and curve vaniſh. If at any value of x all the values of y become impoſſible, the ordinate does not there meet the curve.

5. If two values of y become equal and have the ſame ſign, the ordinate in that ſituation either touches the curve, or paſſes through an interſection of two of its branches, which is called a *punctum duplex*, or through an oval become infinitely little, called a *punctum conjugatum.*

In like manner is a *punctum triplex*, &c. to be determined.

The following example will illuſtrate this doctrine: Let the equation be $ay^2-xy^2=x^3+bx^2$:

Therefore, $y^2=\frac{x^3+bx^2}{a-x}$ and $y=\pm\sqrt{\frac{x^3+bx}{a-x}}$

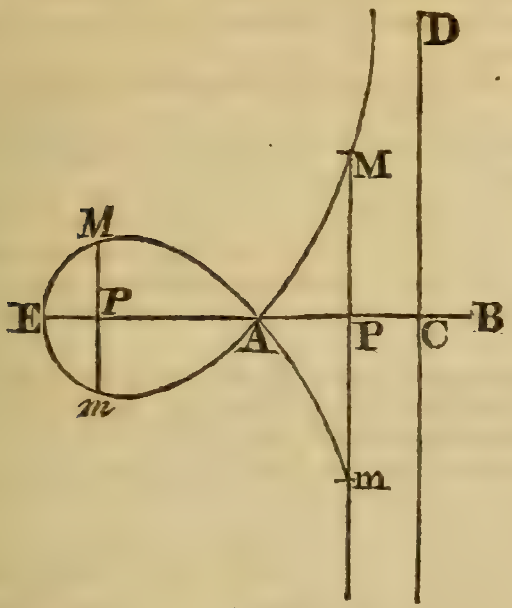
$$=\pm\sqrt{\frac{x+b}{a-x}}\times x.$$

Let AB be aſſumed as a baſe on which the abſciſſes are to be taken from A, and the ordinates perpendicular to it.

Since the two values of y are equal, but have oppoſite ſigns; PM, and Pm which repreſent them, muſt be taken equal to each other on oppoſite ſides of AB; and it is plain that the parts of the curve on the two ſides of AB, muſt be every way ſimilar and equal.

If x is made equal to a, then $y=x\sqrt{\frac{x+b}{0}}$ which is an algebraical expreſſion for infinity; therefore if AC is taken equal to a, the perpendicular CD will become an aſymptote to the curve, which will have two infinite arcs (Obſ. 2.). If x is greater than a, the quantity under the radical ſign becomes negative, and the values of y are impoſſible; that is, no part of the curve lies beyond CD. (4.)

Both branches of the curve paſs through A, ſince $y=0$, when $x=0$. (1.) Let x be negative, and $y=\pm x\sqrt{\frac{b-x}{a+x}}$; the values of y will be poſſible, if x is not greater than b; but if $x=b$, then $y=0$, and if x is greater er than b, the values of y become impoſſible; that is, if the abſciſs AP be taken to the left of A, and leſs than b, there will be two real equal values of y, viz. PM, Pm on the oppoſite ſides as before; if AE be taken equal to b the curve will paſs through E, and no part of it is beyond E. (1. and 4.)



The portion between A and E is called a *Nodus*.

If y be put $=0$, then the values of x are 0, 0, $-b$. That is, the curve paſſes twice through A, or A is a punctum duplex, and it paſſes alſo through E as before. (1.)

The mechanical deſcription of curves mentioned in the beginning of this ſection, may be illuſtrated by the preceding example. For this purpoſe, let any numeral values of a and b be aſſumed; and if ſucceſſive numeral values of x be inſerted, correſponding numeral values of y will be obtained, by which ſo many points in the curve may be conſtructed.

Let $AC=a=10$; $AE=b=12$; and, firſt let $x=1$, then $y=\pm x\sqrt{\frac{x+b}{a-x}}=\pm\frac{\sqrt{13}}{3}=\pm 1.2$ nearly, which gives the length of the ordinates when the abſciſs is 1; and in the ſame manner are the ordinates to be found when x is 2, 3, or any other number. Thus, if $x=6$, then $y=\pm 6\times\frac{\sqrt{18}}{2}=12.73$ nearly; and if AP be taken from the ſcale of equal parts (according to which AB and AE are ſuppoſed to be laid down) and equal to 6, then PM, Pm, being taken from the ſame ſcale, each equal to 12.73, will give the points of the curve M, m. In like manner, if $x=-y$, $y=\pm\sqrt{\frac{3}{19}}=\pm$ 3,58 nearly, and if $AP=9$, then PM, Pm, being taken from the ſame ſcale equal to 3.58, will give the points M, m. In the ſame manner may any number of points be found, and theſe being joined, will give a repreſentation of the curve, which will be more or leſs juſt, according to the number of points found, and the accuracy of the ſeveral operations employed.

By the ſame methods the locus of any other equation is to be traced: Thus, by varying the former equation, the figure of its locus will be varied. If $b=0$, then the points A and E coincide, the nodus vaniſhes, and A is called a *cuſpis*.

If b is negative, then E is to the right of A, which will now be a punctum conjugatum. The reſt of the curve will be between E and C, and CD becomes an aſymptote.

If $a=0$, then $-xy^2=x^3-bx^2$ or $y^2=bx-x^2$, which is an equation to the circle of which $b=AE$ is the diameter.

II. *General Properties of Curves from their Equations.*

The general properties of equations lead to the general affections of curve lines. For example,

A ſtraight line may meet a curve in as many points as there are units in the dimenſion of its equation; for ſo many roots may that equation have. An aſymptote may cut a curve line in as many points, excepting two, as it has dimenſions, and no more. The ſame may be obſerved of the tangent.

Impoſſible roots enter an equation by pairs; therefore the interſections of the ordinate and curve muſt vaniſh by pairs.

The curves of which the number expreſſing the order is odd, muſt have at leaſt two infinite arcs; for the abſciſs may be ſo aſſumed, that, for every value of it, either poſitive or negative, there muſt be at leaſt one value of y, &c.

The properties of the coefficients of the terms of equations, mentioned Part II. Chap. I. furniſh a great number of the curious and univerſal properties of curve lines. For example, the ſecond term of an equation is the ſum of the roots with the ſigns changed, and if the ſecond term is wanting, the poſitive and negative roots muſt be equal. From this it is eaſy to demonſtrate, "That if each of two parallel ſtraight lines meet a curve line in as many points as it has dimenſions, and if a ſtraight line cut theſe two parallels, ſo that the ſum of the ſegments of each on one ſide be equal to the ſum of the ſegments on the other, this ſtraight line will cut any other line parallel to theſe in the ſame manner." Analogous properties, with many other conſequences from them, may be deduced from the compoſition of the coefficients of the other terms.

Many properties of a particular order of curves may be inferred from the properties of equations of that order. Thus, "If a ſtraight line cut a curve of the third order in three points, and if another ſtraight line be drawn, making a given angle with the former, and cutting the curve alſo in three points, the parallelopiped by the ſegments of one of theſe lines between its interſection with the other, and the points where it meets the curve, will be to the parellelopiped by the like ſegments of the other line in a given ratio." This depends upon the compoſition of the abſolute term, and may be extended to curves of any order.

III. *The Subdiviſion of Curves.*

As lines are divided into orders from the dimenſions of their equations, in like manner, from the varieties of the equations of any order, may different *genera* and *ſpecies* of that order be diſtinguiſhed, and from the peculiar properties of theſe varieties, may the affections of the particular curves be diſcovered.

For this purpoſe a complete general equation is aſſumed of that order, and all the varieties in the terms and coefficients which can affect the figure of the locus are enumerated.

It was formerly obſerved, that the equations belonging to any one curve, may be of various forms, according to the poſition of the baſe, and the angle which the ordinate makes with it, though they be all of the ſame order, and have alſo certain properties, which diſtinguiſh them from the other equations of that order.

The locus of ſimple equations is a *ſtraight line.* There are *three* ſpecies of lines of the ſecond order, which are eaſily ſhown to be the *conic ſections,* reckoning the circle and ellipſe to be one. *Seventy-eight* ſpecies have been numbered of the third order: And as the ſuperior orders become too numerous to be particularly reckoned, it is uſual only to divide them into certain general claſſes.

A complete arrangement of the curves of any order would furniſh canons, by which the ſpecies of a curve whoſe equation is of that order might be found.

IV. *Of the place of Curves defined from other principles in the Algebraical Syſtem.*

If a curve line be defined from the ſection of a ſolid, or from any rule different from what has been here ſuppoſed, an equation to it may be derived, by which its order and ſpecies in the algebraical ſyſtem may be found. And, for this purpoſe, any baſe and any angle of the co-ordinates may be aſſumed, from which the equation may be moſt eaſily derived, or may be of the moſt ſimple form.

The three *Conic Sections* are of the ſecond order, as their equations are univerſally quadratic; the *Ciſſoid* of the ancients is of the third order, and the 42d ſpecies, according to Sir Iſaac Newton's enumeration; this is the curve defined by the equation in page 439, col. 1. par. ult. when $b=0$. The curve delineated above in the ſame page, is the 41ſt ſpecies. When b is negative in that equation, the locus is the 43d ſpecies. The *Conchoid* of Nicomedes is of the fourth order; the *Caſſinian* curve is alſo of the fourth order, &c.

It is to be obſerved, that not only the firſt definition of a curve may be expreſſed by an equation, but likewiſe any of thoſe theorems called *loci,* in which ſome property is demonſtrated to belong to every point of the curve. The expreſſion of theſe propoſitions by equations, is ſometimes difficult; no general rules can be given; and it muſt be left to the ſkill and experience of the learner.

Scholium.

This method of treating curve lines by equations, beſides the uſes already hinted at, has many others, which do not belong to this place; ſuch are, the finding the tangents of curves, their curvature, their areas and lengths, &c. The ſolution of theſe problems has been accompliſhed by means of the equations to curves, though by employing, concerning them, a method of reaſoning different from what has been here explained.

CHAP. III.

I. *Conſtruction of the Loci of Equations.*

THE deſcription of a curve, according to the definition of it, is aſſumed in geometry as a *poſtulate.*

If the properties of a particular curve are inveſtigated, it will appear that it may be deſcribed from a variety of data different from thoſe aſſumed in the poſtulate, by demonſtrating the dependence of the former upon the latter.

As the definitions of a curve may be various, ſo alſo may be the poſtulates, and a definition is frequently choſen from the mode of deſcription connected with it. The particular object in view, it was formerly remarked, muſt determine the proper choice of a definition; the ſimplicity of it, the eaſe with which the other properties of the figures may be derived from it, and ſometimes even the eaſe with which it can be executed mechanically, may be conſidered as important circumſtances.

In the ſtraight line, the circle, the conic ſections, and a few curves of the higher orders, the moſt convenient definitions, and the poſtulates connected with them, are generally known and received. An equation to a curve may alſo be aſſumed as a definition of it; and the deſcription of it, according to that definition, may be conſidered as a poſtulate: but, if the geometrical conſtruction of problems is to be inveſtigated by means of algebra, it is often uſeful to deduce from the equation to a curve, thoſe data which, from the geometrical theory of the curve, are known to be neceſſary to its deſcription in the original poſtulate, or in any problem founded upon it. This is called *Conſtructing the locus* of an equation, and from this method are generally derived the moſt elegant conſtructions which can be obtained by the uſe of algebra. In the following ſection, there is an example of a problem reſolved by ſuch conſtructions.

Sometimes a mechanical deſcription of a curve line defined by an equation is uſeful; and as the exhibition of it, by ſuch a motion as is ſuppoſed in that definition, is rarely practicable, it generally becomes neceſſary to contrive ſome more ſimple motion which may in effect correſpond with the other, and may deſcribe the curve with the degree of accuracy which is wanted. Frequently, indeed, the only method which can be conveniently practiſed, is the finding a number of points in the curve by the reſolution of numeral equations, in the manner mentioned in Sect. 1. of this Chapter, and then joining theſe points by the hand; and though this operation is manifeſtly imperfect, it is on ſome occaſions uſeful.

II. *Solution of Problems.*

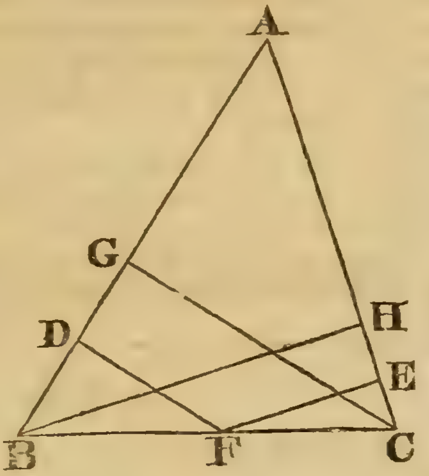
The ſolution of geometrical problems by algebra is much promoted, by deſcribing the loci of the equations ariſing from theſe problems.

For this purpoſe, equations are to be derived, according to the methods formerly deſcribed, and then to be reduced to two, containing each the ſame two unknown quantities. The loci of theſe equations are to be deſcribed, the two unknown quantities being conſidered as the co-ordinates, and placed at the ſame angle in both. The co-ordinates at the interſection of the loci, will be common to both, and give a ſolution of the problem.

The ſimplicity of a conſtruction obtained by this method, will depend upon a proper notation, and the choice of the equations of which the loci are to be deſcribed. Theſe will frequently be different from what would be proper in a different method of ſolution.

Applicati-on to Geo-metry.

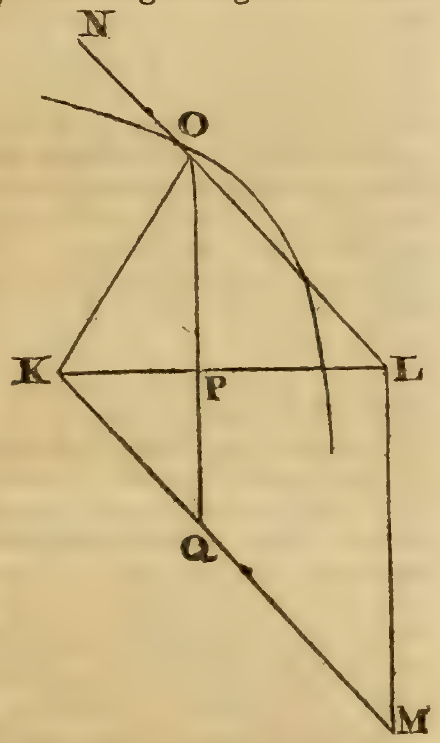
Prob. IV. *To find a Point* F *in the Baſe of the given Triangle* ABC, *ſo that the Sum of the Squares of* FE, FD *drawn from it perpendicular upon the two Sides, may be equal to a given Space.*



Draw BH, CG perpendicular on the two ſides, and let FD$=x$, FE$=y$, BF$=z$, BC$=b$, BH$=p$, CG$=r$, and the given ſpace $FD^2+FE^2=m^2$.

From ſimilar triangles $z : x :: b : r$ and $z=\frac{bx}{r}$. Alſo $b-z : y :: b : p$, and $z=b-\frac{yb}{p}$; therefore $\frac{bx}{r}=b-\frac{yb}{p}$. That is $y=p-\frac{px}{r}$, an equation to a ſtraight line.

But $x^2+y^2=m^2$ of which the locus is a circle, having m for the radius. By conſtructing theſe loci, their interſection will give a ſolution of the problem.



Let KL$=$CG ($=r$) be at right angles to LM$=$BH ($=p$) join KM to which let LN be parallel; LN is the locus of the equation $y=p-\frac{px}{r}$; for let any line OPQ be drawn parallel to LM, if KP $=x$, then PQ $=\frac{px}{r}$ and QO $=$ LM $=p$, therefore PO$=y=p-\frac{px}{r}$.

About the centre K, with a diſtance equal to the line m, let a circle be deſcribed; that circle will be the locus of the equation $m^2=x^2+y^2$; for it is plain that if OP be any perpendicular from the circumference upon KL, KP being x, OP will be y. Either of the points, therefore, in which theſe two loci interſect each other, as O, will give OP an ordinate in both equations, KP being the common abſciſs; therefore KP, OP are the two perpendiculars required, from which the point F is eaſily found.

The conſtruction might have been made on figure 1, with fewer lines. If the circle touches LN, there is only one ſolution which is a minimum; and if the circle does not meet LN, the problem becomes impoſſible.

When the circle touches LN, the radius m muſt be equal to the perpendicular from K on LN, or from L on KM. This perpendicular is equal to $\frac{pr}{\sqrt{p^2+r^2}}$ or a fourth proportional to MK, KL, and LM, and its ſquare therefore is the leaſt ſum of the ſquares of the perpendiculars from a point in the baſe on the two ſides.

Applicati-on to Geo-metry.

It may be remarked alſo, that the point which gives the ſum of the ſquares a minimum, is found by dividing the baſe, in the proportion of the ſquares of the two ſides of the triangle; and this is eaſily demonſtrated from the preceding conſtruction.

Prob. V. *Between two given Lines to find two mean Proportionals.*

Let the lines be a and b, and let the two means be x and y; therefore $a : x : y : b$, and hence $ay=x^2$, and $bx=y^2$, which are both equations to the parabola, and are eaſily conſtructed. The co-ordinates at the interſection of theſe two loci will be the means required.

If one unknown quantity only is aſſumed, or if it is convenient to deduce a final equation containing only one, the conſtruction of the roots is to be obtained by the method mentioned in the next ſection.

Scholium.

The conſtructions of the two preceding problems are geometrical; but it is ſometimes convenient to have a practical ſolution, by the mechanical deſcription either of the algebraical lines employed in the geometrical ſolution, or of other geometrical lines by which it can be effected. But few of theſe are tolerably accurate; ſo that, in general, by means of calculation, the practical operations are all reduced to what may be performed by a ruler and a compaſs.

III. *Conſtruction of Equations.*

The roots of an equation, containing only one unknown quantity, may be found by the interſection of lines, the product of whoſe dimenſions is equal to the dimenſion of that equation. And hence problems are reſolved without an algebraical ſolution of the equation ariſing from them.

Thus cubic and biquadratic equations may be conſtructed by the interſections of two conic ſections as the circle and parabola, which are generally aſſumed as being moſt eaſily deſcribed.

In order to find theſe conſtructions, a new equation is to be aſſumed, containing two variable quantities, one of which is the unknown quantity of the given equation, and the other by ſubſtitution is to be inſerted alſo in the given equation; the interſection of the loci of theſe equations will exhibit the roots required.

Canons may be deviſed for the conſtruction of particular orders, without aſſuming the new equation.

The final equation from prob. 5. would be $x^3=a^2b$, which being conſtructed according to the rules, exhibits the common geometrical ſolution of that problem by the circle and parabola.

If an equation be aſſumed, as $ay=x^2$, the other by ſubſtitution becomes $xy=ab$; the locus of the former is a parabola, and of the latter an hyperbola, one of its aſſymptotes being the baſe, and the co-ordinates at their interſection will repreſent x and y; the firſt of the two means is x, and in this caſe y is the other.

Application to Geometry.

Equations alſo might be aſſumed, ſo as to give a ſolution of this problem by other combinations of two of the conic ſections, one of them not being the circle.

As geometrical magnitudes may be repreſented by algebra, ſo algebraical quantities and numbers may be repreſented by lines. Hence this conſtruction of equations has ſometimes been uſed as an eaſy method of approximation to the roots of numeral equations. For this purpoſe, the neceſſary ſtraight lines muſt be laid down by means of a ſcale of equal parts, and the curve lines, on whoſe interſection the conſtruction depends, muſt be actually deſcribed; the linear roots being meaſured on the ſcale will give the numbers required. Theſe operations may be performed with ſufficient accuracy for certain purpoſes; but as they depend on mechanical principles, the approximation obtained by them cannot be continued at pleaſure; and hence it is ſeldom uſed, except in finding the firſt ſtep of an approximation, which is to be carried on by other methods.

Scholium.

If the relation between the ordinate and abſciſs be fixed, but not expreſſible by a finite equation, the curve is called *Mechanical* (A) or *Tranſcendental*. This claſs is alſo ſometimes defined by equations, by ſuppoſing either x or y in a finite equation to be a curve line, of which the relation to a ſtraight line cannot be expreſſed in finite terms.

If the variable quantities x or y enter the exponents of any term of an equation, the locus of that equation is called an *Exponential Curve*.

Many properties of theſe two claſſes of curves may be diſcovered from their equations.

ALG

Algedo ‖ Algiabarii.

ALGEDO, the running of a gonorrhœa ſtopping ſuddenly after it appears. When it thus ſtops, a pain reaches to the anus, or to the teſticles, without their being ſwelled; and ſometimes this pain reaches to the bladder; in which caſe there is an urging to diſcharge the urine, which is with difficulty paſſed, and in very ſmall quantities at a time. The pain is continued to the bladder by the urethra; to the anus, by the acceleratory muſcles of the penis; and to the teſticles, by the vaſa deferentia, and veſiculæ ſeminales. In this caſe, calomel repeated ſo as to purge, brings back the running, and then all difficulty from this ſymptom ceaſes.

ALGENEB, a fixed ſtar, of the ſecond magnitude, in Perſeus's right ſide; its longitude is 27° 46′ 12″ of Taurus, and its latitude 30° 05′ 28″ north, according to Mr Flamſtead's catalogue.

ALGEZIRA, a town of Andaluſia in Spain, with a port on the coaſt of the Straits of Gibraltar. By this city the Moors entered Spain in 713; and it was taken from them in 1344, after a very long ſiege, remarkable for being the firſt in which cannon were made uſe of. It was called *Old Gibraltar*, and is about four leagues from the New. W. Long. 5. 2. N. Lat. 36. 0.

ALGHIER, or ALGIRI, a town in Sardinia, with a biſhop's ſee, upon the weſtern coaſt of the iſland, between Saſſeri and Boſa. Though it is not large, it is well peopled, and has a commodious port. The coral fiſhed for on this coaſt is in the higheſt eſteem of any in the Mediterranean. E. Long. 8. 40. N. Lat. 41. 30.

ALGIABARII, a Mahometan ſect of predeſtinarians, who attribute all the actions of men, good or evil, to the agency or influence of God. The Algiabarii ſtand oppoſed to the ALKADARII. They hold abſolute decrees and phyſical premotion. For the juſtice of God in puniſhing the evil he has cauſed, they reſolve it wholly into his abſolute dominion over the creatures.

ALG

Algiers.

ALGIERS, a kingdom of Africa, now one of the ſtates of Barbary.—According to the lateſt and beſt computations, it extends 460 miles in length from eaſt to weſt, and is very unequal in breadth; ſome places being ſcarce 40 miles broad, and others upwards of 100. It lies between Long. 1. .0 and 9. 37. W. and extends from Lat. 30. 0. to 47. 0. N.—It is bounded on the north, by the Mediterranean; on the eaſt, by the river Zaine, the ancient Tuſca, which divides it from Tunis; on the weſt, by the Mulvya, and the mountains of Trava, which ſeparate it from Morocco; and on the ſouth by the Sahara, Zaara, or Numidian deſart.

1 Climate & ſoil.

The climate of Algiers is in moſt places ſo moderate, that they enjoy a conſtant verdure; the leaves of the trees being neither parched up by heat in ſummer, nor nipped by the winter's cold. They begin to bud in February; in April the fruit appears in its full bigneſs, and is commonly ripe in May. The ſoil, however, is exceſſively various; ſome places being very hot, dry, and barren, on which account they are generally ſuffered to lie uncultivated by the inhabitants, who are very negligent. Theſe barren places, eſpecially ſuch as lie on the ſouthern ſide, and are at a great diſtance from the ſea, harbour vaſt numbers of wild creatures, as lions, tigers, buffaloes, wild boars, ſtags, porcupines, monkeys, oſtriches, &c. On account of their barrenneſs, they have but few towns, and thoſe thinly peopled; though ſome of them are ſo advantageouſly ſituated for trading with Bildulgerid and Negroland, as to drive a conſiderable traffic with them.

The Algerine kingdom made formerly a conſiderable part of the Mauritania Tingitania (See MAURITANIA), which was reduced to a Roman province by Julius Cæſar, and from him alſo called *Mauritania Cæſarienſis*.—In the general account of Africa, it has been noticed, that the Romans were driven out of that continent by the Vandals; theſe by Beliſarius, the Greek emperor Juſtinian's general; and the Greeks in their turn by the Saracens. This laſt revolution happened

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(A) The term *Mechanical*, in this place, is uſed merely as the name of a particular claſs of curves, without implying that they have any more dependence on the principles of Mechanics or Phyſics than the algebraical curves which have been treated of.

2
Abu-Texefien ſubdues the Arab princes.

happened about the middle of the ſeventh century; and the Arabs continued maſters of the country, divided into a great number of petty kingdoms or ſtates, under chiefs of their own chooſing, till the year 1051. This year, one Abubeker-ben-Omar, or, as the Spaniſh authors call him, *Abu-Texeſien*, an Arab of the Zinhagian tribe, being provoked at the tyranny of thoſe deſpots, gathered, by the help of his marabouts or ſaints, a moſt powerful army of malcontents, in the ſouthern provinces of Numidia and Libya. His followers were nicknamed *Marabites* or *Morabites;* by the Spaniards, *Almoravides;* probably from their being aſſembled principally by the ſaints who were alſo called *Morabites.* The khalif of Keyem's forces were at this time taken up with quelling other revolts in Syria, Meſopotamia, &c. and the Arabs in Spain engaged in the moſt bloody wars; ſo that Texeſien having nothing to fear from them, had all the ſucceſs he could wiſh againſt the Arabian cheyks or petty tyrants, whom he defeated in many battles, and at laſt drove them not only out of Numidia and Lybia, but out of all the weſtern parts, reducing the whole province of Tingitania under his dominion.

Texiſien was ſucceeded by his ſon Yuſef, or Joſeph, a brave and warlike prince. In the beginning of his reign, he laid the foundation of the city of Morocco, which he deſigned to make the capital of his empire. While that city was building, he ſent ſome of his marabouts ambaſſadors to Tremecen (now a province of Algiers), at that time inhabited by a powerful and inſolent ſect of Mahometans called *Zeneti.* The deſign of this embaſſy was to bring them back to what he called the *true faith;* but the Zeneti, deſpiſing his offers, aſſembled at Amaf, or Amfa, their capital, murdered the ambaſſadors, and invaded Joſeph's dominions with an army of 50,000 men.

3
Zeneti deſtroyed.

The king hearing of their infamous proceedings, ſpeedily muſtered his army, and led it by long marches into their country, deſtroying all with fire and ſword; while the Zeneti, inſtead of oppoſing his progreſs, retired as faſt as poſſible towards Fez, in hopes of receiving aſſiſtance from thence. In this they were miſerably deceived: the Fezzans marched out againſt them in a hoſtile manner: and coming up with the unhappy Zeneti, encumbered with their families and baggage, and ready to expire with hunger and wearineſs, they cut them all to pieces, except a ſmall number who were moſtly drowned in attempting to ſwim acroſs a river, and ſome others who in their flight periſhed by falling from the high adjacent rocks. In the mean time Joſeph reduced their country to a mere deſart: which was, however, ſoon peopled by a numerous colony of Fezzans, who ſettled there under the protection of the reigning kings. In this war it is computed that near a million of the Zeneti, men, women, and children, loſt their lives.

The reſtleſs and ambitious temper of Joſeph did not let him remain long at peace. He quickly declared war againſt the Fezzans, reduced them to become his tributaries, and extended his conqueſts all along the Mediterranean. He next attacked ſome Arabian cheyks who had not yet ſubmitted to his juriſdiction; and purſued them with ſuch fury, that neither the Lybian deſarts, nor ridges of the moſt craggy rocks, could ſhelter them from his arms. He attacked them in ſuch of their retreats, caſtles, and fortreſſes, as were till then deemed impregnable; and at laſt ſubdued them, to the great grief of the other African nations, who were greatly annoyed by the ravages committed by his numerous forces.

4
Sharifs of Haſcen, who.

Thus was founded the empire of the Morabites: which, however, was of no long duration; that race being in the 12th century driven out by Mohavedin, a marabout. This race of prieſts was expelled by Abdulac governor of Fez; and he, in the 13th century, ſtripped of his new conqueſts by the Sharifs of *Haſcen*, the deſcendents of thoſe Arabian princes whom Abu-Texefien had formerly expelled.

5
Algerines in danger from the Spaniards.

The better to ſecure their new dominions, the Sharifs divided them into ſeveral little kingdoms or provinces; and among the reſt the preſent kingdom of Algiers was divided into four, namely, *Tremecen*, *Tenez*, *Algiers proper*, and *Bujeyah.* The four firſt monarchs laid ſo good a foundation for a laſting balance of power between their little kingdoms, that they continued for ſome centuries in mutual peace and amity; but at length the king of Tremecen having ventured to violate ſome of their articles, Abul-Farez, king of Tenez declared war againſt him, and obliged him to become his tributary. This king dying ſoon after, and having divided his kingdom among his three ſons, new diſcords aroſe; which Spain taking the advantage of, a powerful fleet and army was ſent againſt Barbary, under the Count of Navarre, in 1505. This commander ſoon made himſelf maſter of the important cities of Oran, Bujeyah, and ſome others; which ſo alarmed the Algerines, that they put themſelves under the protection of Selim Eutemi, a noble and warlike Arabian prince. He came to their aſſiſtance with a great number of his braveſt ſubjects, bringing with him his wife Zaphira, and a ſon then about 12 years old. This however was not ſufficient to prevent the Spaniards from landing a number of forces near Algiers that ſame year, and obliging that metropolis to become tributary to Spain. Nor could Prince Selim hinder them from building a ſtrong fort on a ſmall iſland oppoſite to the city, which terrified their corſairs from ſailing either in or out of the harbour.

6
Invite Barbaroſſa.

To this galling yoke the Algerines were obliged to ſubmit till the year 1516; when hearing of the death of Ferdinand king of Spain, they ſent an embaſſy to *Aruch Barbaroſſa*, who was at this time no leſs dreaded for his valour than his ſurpriſing ſucceſs, and was then ſent on a cruize with a ſquadron of galleys and barks. The purport of the embaſſy was, that he ſhould come and free them from the Spaniſh yoke; for which they agreed to pay him a gratuity anſwerable to ſo great a ſervice. Upon this Barbaroſſa immediately diſpatched 18 galleys and 30 barks to the aſſiſtance of the Algerines; while he himſelf advanced towards the city with 800 Turks, 3000 Jigelites, and 2000 Mooriſh volunteers. Inſtead of taking the neareſt road to Algiers, he directed his courſe towards *Sharſhel*, where *Haſſan*, another famous corſair, had ſettled himſelf. Him he ſurpriſed, and obliged to ſurrender; not without a previous promiſe of friendſhip; but no ſooner had Barbaroſſa got him in his power, than he cut off his head; and obliged all Haſſan's Turks to follow him in his new expedition.

On Barbaroſſa's approach to Algiers, he was met by

7 His treachery and cruelty.

palace Eutemi, attended by all the people of that metropolis, great and ſmall; who looked for deliverance from this abandoned villain, whom they accounted invincible. He was conducted into the city amidſt the acclamations of the people, and lodged in one of the nobleſt apartments of prince Eutemi's palace, where he was treated with the greateſt marks of diſtinction. Elated beyond meaſure with this kind reception, Barbaroſſa formed a deſign of becoming king of Algiers; and fearing ſome oppoſition from the inhabitants, on account of the exceſſes he ſuffered his ſoldiers to commit, murdered prince Eutemi, and cauſed himſelf to be proclaimed king; his Turks and Moors crying out as he rode along the ſtreets, "Long live King Aruch Barbaroſſa, the invincible king of Algiers, the *choſen of God* to deliver the people from the oppreſſion of the Chriſtians; and deſtruction to all that ſhall oppoſe, or refuſe to own him as their lawful ſovereign." Theſe laſt threatening words ſo intimidated the inhabitants, already apprehenſive of a general maſſacre, that he was immediately acknowledged king. The unhappy princeſs Zaphira, it is ſaid, poiſoned herſelf, to avoid the brutality of this new king, whom ſhe unſucceſsfully endeavoured to ſtab with a dagger.

Barbaroſſa was no ſooner ſeated on the throne, than he treated his ſubjects with ſuch cruelty, that they uſed to ſhut up their houſes and hide themſelves when he appeared in public. In conſequence of this, a plot was ſoon formed againſt him; but being diſcovered, he cauſed twenty of the principal conſpirators to be beheaded, their bodies to be buried in a dunghill, and laid a heavy fine on thoſe who ſurvived. This ſo terrified the Algerines, that they never afterwards durſt attempt any thing againſt either Barbaroſſa or his ſucceſſors.

In the mean time, the ſon of prince Eutemi having fled to Oran, and put himſelf under the protection of the marquis of Gomarez, laid before that nobleman a plan for putting the city of Algiers into the hands of the king of Spain. Upon this, young Selim Eutemi was ſent to Spain, to lay his plan before cardinal Ximenes; who having approved of it, ſent a fleet with 10,000 land forces, under the command of *Don Franciſco*, or, as others call him, *Don Diego de Vera*, to drive out the Turks, and reſtore the young prince. But the fleet was no ſooner come within ſight of land, than it was diſperſed by a ſtorm, and the greateſt part of the ſhips daſhed againſt the rocks. Moſt of the Spaniards were drowned; and the few who eſcaped to ſhore were either killed by the Turks or made ſlaves.

Though Barbaroſſa had nothing to boaſt on this occaſion, his pride and inſolence were now ſwelled to ſuch a degree, that he imagined himſelf invincible, and that the very elements conſpired to make him ſo. The Arabians were ſo much alarmed at his ſucceſs, that they implored the aſſiſtance of Hamidel Abdes king of Tenez, to drive the Turks out of Algiers. That prince readily undertook to do what was in his power for this purpoſe, provided they agreed to ſettle the kingdom on himſelf and his deſcendents. This propoſal being accepted, he immediately ſet out at the head of 10,000 Moors; and, upon his entering the Algerine dominions, was joined by all the Arabians in the country. Barbaroſſa engaged him, only with 1000 Turkiſh muſqueteers and 500 Granada Moors; totally defeated his numerous army; purſued him to the very gates of his capital, which he eaſily made himſelf maſter of; and, having given it up to be plundered by his Turks, obliged the inhabitants to acknowledge him as their ſovereign. This victory, however, was chiefly owing to the advantage which his troops had from their fire-arms: the enemy having no other weapons than arrows and javelins.

No ſooner was Barbaroſſa become maſter of the kingdom of Tenez, than he received an embaſſy from the inhabitants of Tremecen; inviting him to come to their aſſiſtance againſt their then reigning prince, with whom they were diſſatisfied on account of his having dethroned his nephew, and forced him to fly to Oran; offering him even the ſovereignty, in caſe he accepted of their propoſal. The king of Tremecen, not ſuſpecting the treachery of his ſubjects, met the tyrant with an army of 6000 horſe and 3000 foot; but Barbaroſſa's artillery gave him ſuch an advantage, that the king was at length forced to retire into the capital; which he had no ſooner entered, than his head was cut off, and ſent to Barbaroſſa, with a freſh invitation to come and take poſſeſſion of the kingdom. On his approach, he was met by the inhabitants, whom he received with great complaiſance, and many fair promiſes; but beginning to tyrannize as uſual, his new ſubjects ſoon convinced him that they were not ſo paſſive as the inhabitants of Algiers. Apprehending, therefore, that his reign might prove uneaſy and precarious, he entered into an alliance with the king of Fez; after which, he took care to ſecure the reſt of the cities in his new kingdom, by garriſoning them with his own troops. Some of theſe, however, revolted ſoon after; upon which he ſent one of his corſairs, named *Eſcander*, a man no leſs cruel than himſelf, to reduce them. The Tremecenians now began to repent in good earneſt of their having invited ſuch a tyrant to their aſſiſtance; and held conſultations on the moſt proper means of driving him away, and bringing back their lawful prince *Abuchen Men*: but their cabals being diſcovered, a great number of the conſpirators were maſſacred in the moſt cruel manner. The prince had the good luck to eſcape to Oran, and was taken under the protection of the marquis of Gomarez, who ſent immediate advice of it to Charles V. then lately arrived in Spain, with a powerful fleet and army. That monarch immediately ordered the young king a ſuccour of 10,000 men, under the command of the governor of Oran; who, under the guidance of Abuchen Men, began his march towards Tremecen; and in their way they were joined by prince Selim, with a great number of Arabs and Moors. The firſt thing they reſolved upon was, to attack the important fortreſs of *Calau*, ſituated between Tremecen and Algiers, and commanded by the corſair Eſcander at the head of about 300 Turks. They inveſted it cloſely on all ſides, in hopes Barbaroſſa would come out of Tremecen to its relief, which would give the Tremecenians an opportunity of keeping him out. That tyrant, however, kept cloſe in his capital, being embarraſſed by his fears of a revolt, and the politic delays of the king of Fez, who had not ſent the auxiliaries he promiſed. The garriſon of Calau, in the mean time, made a brave defence; and, in a ſally they made at night, cut off near 300 Spaniards. This encouraged them to venture a ſecond time; but they were now repulſed with great loſs, and Eſcander himſelf wounded:

ſoon after which, they ſurrendered upon honourable terms; but were all maſſacred by the Arabians, except 16, who clung cloſe to the ſtirrups of the king, and of the Spaniſh general.

Barbaroſſa being now informed that Abuchen Men, with his Arabs, accompanied by the Spaniards, were in full march to lay ſiege to Tremecen, thought proper to come out, at the head of 1500 Turks and 5000 Mooriſh horſe, in order to break his way through the enemy; but he had not proceeded far from the city, before his council adviſed him to return and fortify himſelf in it. This advice was now too late; the inhabitants being reſolved to keep him out, and open their gates to their own lawful prince as ſoon as he appeared. In this diſtreſs Barbaroſſa ſaw no way left but to retire to the citadel, and there defend himſelf till he could find an opportunity of ſtealing out with his men and all his treaſure. Here he defended himſelf vigorouſly; but his proviſions failing him, he took advantage of a ſubterraneous back-way, which he had cauſed to be digged up for that purpoſe, and, taking his immenſe treaſure with him, ſtole away as ſecretly as he could. His flight, however, was ſoon diſcovered; and he was ſo cloſely purſued, that to amuſe, as he hoped, the enemy, he cauſed a great deal of his money, plate, jewels, &c. to be ſcattered all the way, thinking they would not fail to ſtop their purſuit to gather it up. This ſtratagem, however, failed, through the vigilance of the Spaniſh commander, who being himſelf at the head of the purſuers, obliged them to march on, till he was come up cloſe to him on the banks of the *Huexda*, about eight leagues from Tremecen. Barbaroſſa had juſt croſſed the river with his vanguard, when the Spaniards came up with his rear on the other ſide, and cut them all off; and then croſſing the water, overtook him at a ſmall diſtance from it. Here a bloody engagement enſued, in which the Turks fought like as many lions; but, being at length overpowered by numbers, they were all cut to pieces, and Barbaroſſa among the reſt, in the 44th year of his age, and four years after he had raiſed himſelf to the royal title of *Jigel* of the adjacent country; two years after he had acquired the ſovereignty of Algiers, and ſcarce a twelvemonth after the reduction of Tremecen. His head was carried to Tremecen, on the point of a ſpear; and Abuchen Men proclaimed king, to the joy of all the inhabitants. A few days after the fight, the king of Fez made his appearance at the head of 20,000 horſe, near the field of battle; but hearing of Barbaroſſa's defeat and death, marched off with all poſſible ſpeed, to avoid being attacked by the enemy.

8 Barbaroſſa defeated and killed by the Spaniards.

9 Succeeded by Hayradin.

The news of Barbaroſſa's death ſpread the utmoſt conſternation among the Turks at Algiers; however, they cauſed his brother Hayradin to be immediately proclaimed king. The Spaniſh commander now ſent back the emperor's forces, without making any attempt upon Algiers; by which he loſt the opportunity of driving the Turks out of that country; while Hayradin, juſtly dreading the conſequences of the tyranny of his officers, ſought the protection of the Grand Signior. This was readily granted, and himſelf appointed baſhaw or viceroy of Algiers; by which means he received ſuch conſiderable reinforcements, that the unhappy Algerines durſt not make the leaſt complaint; and ſuch numbers of Turks reſorted to him, that he was not only capable of keeping the Moors and Arabs in ſubjection at home, but of annoying the Chriſtians at ſea. His firſt ſtep was to take the Spaniſh fort abovementioned, which was a great nuiſance to his metropolis. The Spaniards held out to the laſt extremity; but being all ſlain or wounded, Hayradin eaſily became maſter of the place.

10 He takes the Spaniſh fort.

Hayradin next ſet about building a ſtrong mole for the ſafety of his ſhips. In this he employed 30,000 Chriſtian ſlaves, whom he obliged to work without intermiſſion for three years; in which time the work was completed. He then cauſed the fort he had taken from the Spaniards to be repaired, and placed a ſtrong garriſon in it, to prevent any foreign veſſels from entering the harbour without giving an account of themſelves. By theſe two important works, Hayradin ſoon became dreaded not only by the Arabs and Moors, but alſo by the maritime Chriſtian powers, eſpecially the Spaniards. The viceroy failed not to acquaint the Grand Signior with his ſucceſs, and obtained from him a freſh ſupply of money, by which he was enabled to build a ſtronger fort, and to erect batteries on all places that might favour the landing of an enemy. All theſe have ſince received greater improvements from time to time, as often as there was occaſion for them.

11 Succeeded by Haſſan Aga.

In the mean time the Sultan, either out of a ſenſe of the great ſervices Hayradin had done, or perhaps out of jealouſy leſt he ſhould make himſelf independent, raiſed Hayradin to the dignity of baſhaw of the empire, and appointed Haſſan Aga, a Sardinian renegado, an intrepid warrior, and an experienced officer, to ſucceed him as baſhaw of Algiers. Haſſan had no ſooner taken poſſeſſion of his new government, than he began to purſue his ravages on the Spaniſh coaſt with greater fury than ever; extending them to the eccleſiaſtical ſtate, and other parts of Italy. But Pope Paul III. being alarmed at this, exhorted the emperor Charles V. to ſend a powerful fleet to ſuppreſs theſe frequent and cruel piracies; and, that nothing might be wanting to render the enterpriſe ſucceſsful, a bull was publiſhed by his holineſs, wherein a plenary abſolution of ſins, and the crown of martyrdom, was promiſed to all thoſe who either fell in battle or were made ſlaves. The emperor on his part needed no ſpur; and therefore ſet ſail at the head of a powerful fleet conſiſting of 120 ſhips and 20 galleys, having on board 30,000 choſen troops, an immenſe quantity of money, arms, ammunition, &c. In this expedition many young nobility and gentry attended as volunteers, and among theſe many knights of Malta, ſo remarkable for their valour againſt the enemies of Chriſtianity. Even ladies of birth and character attended Charles in his expedition, and the wives and daughters of the officers and ſoldiers followed them with a deſign to ſettle in Barbary after the conqueſt was finiſhed. All theſe meeting with a favourable wind, ſoon appeared before Algiers; every ſhip diſplaying the Spaniſh colours on the ſtern, and another at the head, with a crucifix to ſerve them for a pilot.

12 Charles Vth's expedition againſt Algiers.

13 Algiers in great conſternation.

By this prodigious armament, the Algerines were thrown into the utmoſt conſternation. The city was ſurrounded only by a wall with ſcarce any outworks. The whole garriſon conſiſted of 800 Turks and 6000 Moors, without fire-arms, and poorly diſciplined and accoutred; the reſt of their forces being diſperſed in the other provinces of the kingdom, to levy the uſual tribute on the Arabs and Moors. The Spaniards landed without oppoſition, and immediately built a fort, under the cannon of which they encamped, and diverted the courſe of a ſpring which ſupplied the city with water. Being now reduced to the utmoſt diſtreſs, Haſſan received a ſummons to ſurrender at diſcretion, on pain of being put to the ſword with all the garriſon. The herald was ordered to extol the vaſt power of the emperor both by ſea and land, and to exhort him to return to the Chriſtian religion. But to this Haſſan only replied, that he muſt be a madman who would pretend to adviſe an enemy, and that the adviſed muſt ſtill act more madly who would take counſel of ſuch an adviſer. He was, however, on the point of ſurrendering the city, when advice was brought him that the forces belonging to the weſtern government were in full march towards the place; upon which it was reſolved to defend it to the utmoſt. Charles, in the mean time, reſolving upon a general aſſault, kept a conſtant firing upon the town; which, from the weak defence made by the garriſon, he looked upon as already in his hands. But while the *douwan*, or Algerine ſenate, were deliberating on the moſt proper means of obtaining an honourable capitulation, a mad prophet, attended by a multitude of people, entered the aſſembly, and foretold the ſpeedy deſtruction of the Spaniards before the end of the moon, exhorting the inhabitants to hold out till that time. This prediction was ſoon accompliſhed in a very ſurpriſing and unexpected manner: for, on the 28th of October 1541, a dreadful ſtorm of wind, rain, and hail, aroſe from the north, accompanied with violent ſhocks of earthquakes, and a diſmal and univerſal darkneſs both by ſea and land; ſo that the ſun, moon, and elements, ſeemed to combine together for the deſtruction of the Spaniards. In that one night, ſome ſay in leſs than half an hour, 86 ſhips and 15 galleys were deſtroyed, with all their crews and military ſtores; by which the army on ſhore was deprived of all means of ſubſiſting in theſe parts. Their camp alſo, which ſpread itſelf along the plain under the fort, was laid quite under water by the torrents which deſcended from the neighbouring hills. Many of the troops, by trying to remove into ſome better ſituation, were cut in pieces by the Moors and Arabs; while ſeveral galleys, and other veſſels, endeavouring to gain ſome neighbouring creek along the coaſts, were immediately plundered, and their crews maſſacred by the inhabitants.

14
Prevented by a mad prophet from ſurrendering.

15
Spaniſh fleet deſtroyed by a ſtorm.

The next morning Charles beheld the ſea covered with the fragments of ſo many ſhips, and the bodies of men, horſes, and other creatures, ſwimming on the waves; at which he was ſo diſheartened, that abandoning his tents, artillery, and all his heavy baggage, to the enemy, he marched at the head of his army, though in no ſmall diſorder, towards cape *Malabux*, in order to reimbark in thoſe few veſſels which had outweathered the ſtorm. But Haſſan, who had cauſed his motions to be watched, allowed him juſt time to get to the ſhore, when he ſallied out and attacked the Spaniards in the midſt of their hurry and confuſion to get into their ſhips, killing great numbers, and bringing away a ſtill greater number of captives; after which he returned in triumph to Algiers, where he celebrated with great rejoicings his happy deliverance from ſuch diſtreſs and danger.

16
Siege of Algiers raiſed

Soon after this, the prophet *Yuſef*, who had foretold the deſtruction of the Spaniards, was not only declared the deliverer of his country, but had a conſiderable gratuity decreed him, with the liberty of exerciſing his prophetic function unmoleſted. It was not long, however, before the marabouts, and ſome interpreters of the law, made a ſtrong oppoſition againſt him; remonſtrating to the baſhaw, how ridiculous and ſcandalous it was to their nation, to aſcribe the deliverance of it to a poor fortune-teller, which had been obtained by the fervent prayers of an eminent ſaint of their own profeſſion. But though the baſhaw and his douwan ſeemed, out of policy, to give into this laſt notion, yet the impreſſion which Yuſef's predictions and their late accompliſhments had made upon the minds of the common people, proved too ſtrong to be eradicated; and the ſpirit of divination and conjuring has ſince got into ſuch credit among them, that not only their great ſtateſmen, but their prieſts, marabouts, and ſantoons, have applied themſelves to that ſtudy, and dignified it with the name of *Mahomet's Revelations*.

17
The mad prophet rewarded.

The unhappy Spaniards had ſcarce reached their ſhips, when they were attacked by a freſh ſtorm, in which ſeveral more of them periſhed; one ſhip in particular, containing 700 ſoldiers, beſides ſailors, ſunk in the emperor's ſight, without a poſſibility of ſaving a ſingle man. At length, with much labour, they reached the port of *Bujeyah*, at that time poſſeſſed by the Spaniards, whither Haſſan king of Tunis ſoon after repaired, with a ſupply of proviſions for the emperor, who received him graciouſly, with freſh aſſurances of his favour and protection. Here he diſmiſſed the few remains of the Malteſe knights and their forces, who embarked in three ſhattered galleys, and with much difficulty and danger reached their own country. Charles himſelf ſtaid no longer than till the 16th of November, when he ſailed for Carthagena, and reached it on the 25th of the ſame month. In this unfortunate expedition upwards of 120 ſhips and galleys were loſt, above 300 colonels and other land and ſea officers, 8000 ſoldiers and marines, beſides thoſe deſtroyed by the enemy on the reimbarkation, or drowned in the laſt ſtorm. The number of priſoners was ſo great, that the Algerines ſold ſome of them, by way of contempt, for an onion per head.

18
Freſh calamities of the Spaniards.

Haſſan, elated with this victory, in which he had very little ſhare, undertook an expedition againſt the king of Tremecen, who, being now deprived of the aſſiſtance of the Spaniards, was forced to procure a peace by paying a vaſt ſum of money, and becoming tributary to him. The baſhaw returned to Algiers, laden with riches; and ſoon after died of a fever, in the 66th year of his age.

19
Haſſan reduces Tremecen.

From this time the Spaniards were never able to annoy the Algerines in any conſiderable degree. In 1555, they loſt the city of Bujeyah, which was taken by *Salha Rais*, Haſſan's ſucceſſor; who next year ſet out on a new expedition, which he kept a ſecret, but was ſuſpected to be intended againſt Oran: but he was ſcarcely got four leagues from Algiers, when the plague, which at that time raged violently in the city, broke out in his groin, and carried him off in 24 hours.

20
Bujeyah taken from the Spaniards.

Immediately after his death the Algerine ſoldiery choſe a Corſican renegado, Haſſan Corſo, in his room, till they ſhould receive farther orders from the Porte.

21
Haſſan Corſo choſen baſhaw by the Janiſaries.

He did not accept of the baſhawſhip without a good deal of difficulty; but immediately proſecuted the intended expedition againſt Oran, diſpatching a meſſenger to acquaint the Porte with what had happened. They had hardly begun their hoſtilities againſt the place, when orders came from the Porte, expreſsly forbidding Haſſan Corſo to begin the ſiege, or, if he had begun it, enjoining him to raiſe it immediately. This news was received with great grief by the whole fleet and army, as they thought themſelves ſure of ſucceſs, the garriſon being at that time very weak. Nevertheleſs, as they dared not diſobey, the ſiege was immediately raiſed.

22
Superſeded by Tekelli, who puts him to a cruel death.

Corſo had hardly enjoyed his dignity four months, before news came, that eight galleys were bringing a new baſhaw to ſucceed him; one *Tekelli*, a principal Turk of the Grand Signior's court: upon which the Algerines unanimouſly reſolved not to admit him. By the treachery of the Levantine ſoldiers, however, he was admitted at laſt, and the unfortunate Corſo thrown over a wall in which a number of iron hooks were fixed; one of which catching the ribs of his right ſide, he hung three days in the moſt exquiſite torture before he expired.

Tekelli was no ſooner entered upon his new government, than he behaved with ſuch cruelty and rapaciouſneſs, that he was aſſaſſinated even under the dome of a ſaint, by Yuſef Calabres, the favourite renegado of Haſſan Corſo; who for this ſervice was unanimouſly choſen baſhaw, but died of the plague ſix days after his election.

23
Haſſan reinſtated.

24
Spaniards defeated with great ſlaughter.

Yuſef was ſucceeded by Haſſan the ſon of Hayradin, who had been formerly recalled from his baſhawſhip, when he was ſucceeded by Selha-Rais; and now had the good fortune to get himſelf reinſtated in his employment. Immediately on his arrival, he engaged in a war with the Arabs, by whom he was defeated with great loſs. The next year, the Spaniards undertook an expedition againſt Moſtagan, under the command of the count d'Alcandela; but were utterly defeated, the commander himſelf killed, and 12,000 taken priſoners. This diſaſter was owing to the inconſiderate raſhneſs, or rather madneſs, of the commander; which was ſo great, that, after finding it impoſſible to rally his ſcattered forces, he ruſhed, ſword in hand, into the thickeſt of the enemy's ranks, at the head of a ſmall number of men, crying out, "St Jago! St Jago! the victory is ours, the enemy is defeated;" ſoon after which he was thrown from his horſe, and trampled to death.

25
Haſſan ſent in irons to Conſtantinople.

26
Reinſtated.

Haſſan having had the misfortune to diſoblige his ſubjects by allowing the mountaineers of Cuco to buy ammunition at Algiers, was ſent in irons to Conſtantinople, while the aga of the Janiſaries, and general of the land forces, ſupplied his place.—Haſſan eaſily found means to clear himſelf; but a new baſhaw was appointed, called Achmet; who was no ſooner arrived, than he ſent the two deputy-baſhaws to Conſtantinople, where their heads were ſtruck off.—Achmet was a man of ſuch inſatiable avarice, that, upon his arrival at Algiers, all ranks of people came in ſhoals to make him preſents; which he the more greedily accepted, as he had bought his dignity by the money he had amaſſed while head gardener to the Sultan. He enjoyed it, however, only four months; and after his death, the ſtate was governed other four months by his lieutenant; when Haſſan was a third time ſent viceroy to Algiers, where he was received with the greateſt demonſtrations of joy.

27
Siege of Marſalquiver.

The firſt enterpriſe in which Haſſan engaged, was the ſiege of Marſalquiver, ſituated near the city Oran, which he deſigned to inveſt immediately after. The army employed in this ſiege conſiſted of 26,000 foot and 10,000 horſe, beſides which he had a fleet conſiſting of 32 galleys and galliots, together with three French veſſels laden with biſcuit, oil, and other proviſions. The city was defended by Don Martin de Cordova, brother of the Count d'Alcandela, who had been taken priſoner in the battle where that nobleman was killed, but had obtained his liberty from the Algerines with immenſe ſums, and now made a moſt gallant defence againſt the Turks. The city was attacked with the utmoſt fury by ſea and land, ſo that ſeveral breaches were made in the walls. The Turkiſh ſtandards were ſeveral times planted on the walls, and as often diſlodged; but the place muſt have in the end ſubmitted, had not Haſſan been obliged to raiſe the ſiege in haſte, on the news that the famed Genoeſe admiral Doria was approaching with conſiderable ſuccours from Italy. The fleet accordingly arrived ſoon after; but miſſing the Algerine gallies, bore away for Pennon de Velez, where they were ſhamefully repulſed by an handful of Turks who garriſoned that place; which, however, was taken the following year.

28
Haſſan again recalled.

29
John Gaſcon's bold attempt to fire the Algerine fleet.

30
His bravado at the city gate.

In 1567, Haſſan was again recalled to Conſtantinople, where he died three years after. He was ſucceeded by Mahomet, who gained the love of the Algerines by ſeveral public-ſpirited actions. He incorporated the Janiſaries and Levantine Turks together, and by that means put an end to their diſſenſions, which laid the foundation of the Algerine independency on the Porte. He likewiſe added ſome conſiderable fortifications to the city and caſtle, which he deſigned to render impregnable. But while he was thus ſtudying the intereſt of Algiers, one John Gaſcon, a bold Spaniſh adventurer, formed a deſign of ſurpriſing the whole piratic navy in the bay, and ſetting them on fire in the night-time, when they lay defenceleſs, and in their firſt ſleep. For this he had not only the permiſſion of king Philip II. but was furniſhed by him with proper veſſels, mariners, and fireworks, for the execution of his plot. With theſe he ſet ſail for Algiers in the moſt proper ſeaſon, *viz.* the beginning of October, when moſt, if not all the ſhips lay at anchor there; and eaſily ſailed near enough, unſuſpected, to view their manner of riding, in order to catch them napping, at a time when the greater part of their crew were diſperſed in their quarters. He came accordingly, unperceived by any, to the very mole-gate, and diſperſed his men with their fire-works; but to their great ſurpriſe, they found them ſo ill mixed, that they could not with all their art make them take fire. In the mean time, Gaſcon took it into his head, by way of bravado, to go to the mole-gate, and give three loud knocks at it with the pommel of his dagger, and to leave it fixed in the gate by its point, that the Algerines might have cauſe to remember him. This he had the good fortune to do without meeting with any diſturbance or oppoſition: but it was not ſo with his men; for no ſooner did they find their endeavours unſucceſsful, than they made ſuch a buſtle as quickly alarmed the guard poſted on the ad-

31
Is taken and put to death

jacent baſtion, from which the uproar quickly ſpread itſelf thro' the whole garriſon. Gaſcon now finding himſelf in the utmoſt danger, ſailed away with all poſſible haſte: but he was purſued, overtaken, and brought back a priſoner to Mahomet; who no ſooner got him into his power, than he immediately cauſed a gibbet of conſiderable height to be erected on the ſpot where Gaſcon had landed, ordering him to be hoiſted up, and hung by the feet to a hook, that he might die in exquiſite torture; and to ſhow his reſentment and contempt of the king his maſter, he ordered his commiſſion to be tied to his toes. He had not, however, hung long in that ſtate, when the captain who took him, accompanied by a number of other corſairs, interceded ſo ſtrongly in his behalf, that he was taken down, and put under the care of ſome Chriſtian ſurgeon; but two days after, ſome Moors reporting that it was the common talk and belief in Spain, that the Algerines durſt not hurt a hair of Gaſcon's head, *&c.* the unfortunate Spaniard was hoiſted up by a pulley to the top of the execution-wall, and let down again upon the hook, which in his fall catched him by the belly, and gave him ſuch a wound, that he expired without a groan.——Thus ended the expedition of John Gaſcon, which has procured him a place among the Spaniſh martyrs; while, on the other hand, the Algerines look upon his diſappointment to have been miraculous, and owing to the efficacious protection of the powerful ſaint *Sidi Outededda*, whoſe prayers had before raiſed ſuch a terrible ſtorm againſt the Spaniſh fleet.

Mahomet, being ſoon after recalled, was ſucceeded by the famous renegado Ochali, who reduced the kingdom of Tunis; which, however, remained ſubject to the viceroy of Algiers only till the year 1586, when a baſhaw of Tunis was appointed by the Porte.

The kingdom of Algiers continued to be governed, till the beginning of the ſeventeenth century, by viceroys or baſhaws appointed by the Porte; concerning whom we find nothing very remarkable, further than that their avarice and tyranny was intolerable both to the Algerines and the Turks themſelves. At laſt the Turkiſh Janiſaries and militia becoming powerful enough to ſuppreſs the tyrannic ſway of theſe baſhaws, and the people being almoſt exhauſted by the heavy taxes laid upon them, the former reſolved to depoſe theſe petty tyrants, and ſet up ſome officers of their own at the head of the realm. The better to ſucceed in this attempt, the militia ſent a deputation of ſome of their chief members to the Porte, to complain of the avarice and oppreſſion of theſe baſhaws, who ſunk both the revenue of the ſtate, and the money remitted to it from Conſtantinople, into their own coffers, which ſhould have been employed in keeping up and paying the ſoldiery; by which means they were in continual danger of being overpowered by the Arabians and Moors, who, if ever ſo little aſſiſted by any Chriſtian power, would hardly fail of driving all the Turks out of the kingdom. They repreſented to the Grand Vizir how much more honourable, as well as eaſier and cheaper, it would be for the Grand Signior to permit them to chooſe their own dey, or governor, from among themſelves, whoſe intereſt it would then be to ſee that the revenue of the kingdom was rightly applied in keeping up its forces complete, and in ſupplying all other exigencies of the ſtate, without any farther charge or trouble to the Porte than that of allowing them its protection. On their part, they engaged always to acknowledge the Grand Signiors as their ſovereigns, and to pay them their uſual allegiance and tribute, to reſpect their baſhaws, and even to lodge and maintain them and their retinue, in a manner ſuitable to their dignity, at their own charge. The baſhaws, however, were, for the future, to be excluded from aſſiſting at any but general douwans, unleſs invited to it; and from having the liberty of voting in them, unleſs when their advice was aſked, or the intereſt of the Porte was likely to ſuffer by their ſilence. All other concerns, which related to the government of Algiers, were to be wholly left under the direction of the dey and his douwan.

32
Algerines allowed to chuſe their own deys.

Theſe propoſals having been accepted by the Porte, the deputies returned highly ſatisfied; and having notified their new privileges, the great *douwan* immediately proceeded to the election of a dey from among themſelves. They compiled a new ſet of laws, and made ſeveral regulations for the better ſupport and maintenance of this new form of government, to the obſervation of which they obliged all their ſubjects to ſwear; and the militia, navy, commerce, &c. were all ſettled pretty nearly on the footing upon which they now are, and which ſhall be afterwards deſcribed; tho' the ſubſequent altercations that frequently happened between the baſhaws and deys, the one endeavouring to recover their former power, and the other to curtail it, cauſed ſuch frequent complaints and diſcontents at the Ottoman court, as made them frequently repent their compliance.

In the year 1601, the Spaniards, under the command of Doria the Genoeſe admiral, made another attempt upon Algiers, in which they were more fortunate than uſual, their fleet being only driven back by contrary winds, ſo that they came off without loſs. In 1609, the Moors being expelled from Spain, flocked in great numbers to Algiers; and as many of them were very able ſailors, they undoubtedly contributed to make the Algerine fleet ſo formidable as it became ſoon after; tho' it is probable the frequent attempts made on their city would alſo induce them to increaſe their fleet. In 1616, their fleet conſiſted of 40 ſail of ſhips between 200 and 400 tons, their admiral 500 tons. It was divided into two ſquadrons, one of 18 ſail, before the port of Malaga; and the other at the Cape of Santa Maria, between Liſbon and Seville; both of which fell foul on all Chriſtian ſhips, both Engliſh and French, with whom they pretended to be in friendſhip, as well as Spaniards and Portugueſe, with whom they were at war.

33
They gro formidabl to the Europeans.

The Algerines were now become very formidable to the European powers. The Spaniards, who were moſt in danger, and leaſt able to cope with them, ſolicited the aſſiſtance of England, the pope, and other ſtates. The French, however, were the firſt who dared to ſhow their reſentment of the perfidious behaviour of theſe miſcreants; and in 1617, M. Beaulieu was ſent againſt them with a fleet of 50 men of war, who defeated their fleet, took two of their veſſels, while their admiral ſunk his own ſhip and crew, rather than fall into his enemies hands.

In 1620, a ſpuadron of Engliſh men of war was ſent againſt Algiers, under the conduct of Sir Robert

34
An Engliſh
quadron
ent againſt
he Alge-
ines.

Manſel: but of this expedition we have no other account, than that it returned without doing any thing; and the Algerines, becoming more and more inſolent, openly defied all the European powers, the Dutch only excepted; to whom, in 1625, they ſent a propoſal, directed to the prince of Orange, that in caſe they would fit out 20 ſail of ſhips the following year, upon any good ſervice againſt the Spaniards, they would join them with 60 ſail of their own.

The next year, the *Coulolies* or *Cologlies* (the children of ſuch Turks as had been permitted to marry at Algiers), who were enrolled in the militia, having ſeized on the citadel, had well nigh made themſelves maſters of the city; but were attacked by the Turks and renegadoes, who defeated them with terrible ſlaughter. Many ſcores of them were executed; and their heads thrown in heaps upon the city walls, without the eaſtern gate. Part of the citadel was blown up; and the remaining Coulolies were diſmiſſed from the militia, to which they were not again admitted till long after.

35
States of Barbary throw off their dependence on the Porte.

In 1623, the Algerines and other ſtates of Barbary threw off their dependence on the Porte altogether, and ſet up for themſelves. What gave occaſion to this was the 25 years truce which Sultan Amurath IV. was obliged to make with the emperor Ferdinand II, to prevent his being overmatched by carrying on a war againſt him and the ſophi of Perſia at the ſame time. As this put a ſtop to the piratical trade of the Algerines, they proceeded as above-mentioned; and reſolved, that whoever deſired to be at peace with them, muſt, diſtinctly and ſeparately, apply to their government.—No ſooner was this reſolution taken, than the Algerines began to make prizes of ſeveral merchant ſhips belonging to powers at peace with the Porte. Nay, having ſeized a Dutch ſhip and poleacre at Scanderoon, they ventured on ſhore; and finding the town abandoned by the Turkiſh aga and inhabitants, they plundered all the magazines and warehouſes, and ſet them on fire.—About this time Lewis XIII. undertook to build a fort on their coaſts, in ſtead of one formerly built by the Marſilians, and which they had demoliſhed. This, after ſome difficulty, he accompliſhed; and it was called the *Baſtion of France:* but the ſituation being afterwards found inconvenient, the French purchaſed the port of La Calle, and obtained liberty to trade with the Arabians and Moors. The Ottoman court, in the mean time, was ſo much embarraſſed with the Perſian war, that there was no leiſure to check the Algerine piracies. This gave an opportunity to the vizir and other courtiers to compound matters with the Algerines, and to get a ſhare of their prizes, which were very conſiderable. However, for form's ſake, a ſevere reprimand, accompanied with threats, was ſent them; to which they replied, that "theſe depredations deſerved to be indulged to them, ſeeing they were the only bulwark againſt the Chriſtian powers, eſpecially againſt the Spaniards, the ſworn enemies of the Moſlem name." Adding, that "if they ſhould pay a punctilious regard to all that would purchaſe peace, or liberty to trade with the Ottoman empire, they would have nothing to do but ſet fire to all their ſhipping, and turn camel-drivers for a livelihood."

36
Deſperate undertaking of four younger brothers.

In the year 1635, four younger brothers of a good family in France, entered into an undertaking ſo deſperate, that perhaps the annals of knight-errantry can ſcarce furniſh its equal.—This was no leſs than to retort the piracies of the Algerines upon themſelves; and as they indiſcriminately took the ſhips of all nations, ſo were theſe heroes indiſcriminately to take the ſhips belonging to Algiers; and this with a ſmall frigate of ten guns!—In this ridiculous undertaking, 100 volunteers embarked; a Malteſe commiſſion was procured, together with an able maſter, and 36 mariners.—They had the good fortune, on their firſt ſetting out, to take a ſhip laden with wine, on the Spaniſh coaſt: with which they were ſo much elated, that three days after they madly encountered two large Algerine corſairs, one of 20 and the other of 24 guns, both well manned, and commanded by able officers. Theſe two large veſſels having got the ſmall frigate between them, plied her furiouſly with great ſhot, which ſoon took off her main maſt: notwithſtanding which, the French made ſo deſperate a reſiſtance, that the pirates were not able to take them, till the noiſe of their firing brought up five more Algerines; when the French veſſel, being almoſt torn to pieces, was boarded and taken. The young knights-errant were puniſhed for their temerity by a dreadful captivity, from which they redeemed themſelves in 1642 at the price of 6000 dollars.

37
A French admiral carries off the Turkiſh baſhaw.

The Algerines proſecuted their piracies with impunity, to the terror and diſgrace of the Europeans, till the year 1652; when a French fleet being accidentally driven into Algiers, the admiral took it into his head to demand a releaſe of all the captives of his nation, without exception. This being refuſed, the Frenchman without ceremony carried off the Turkiſh viceroy, and his cadi or judge, who were juſt arrived from the Porte, with all their equipage and retinue. The Algerines, by way of repriſal, ſurpriſed the Baſtion of France already mentioned, and carried off the inhabitants to the number of 600, with all their effects; which ſo provoked the admiral, that he ſent them word that he would pay them another viſit the next year with his whole fleet.

38
The Algerines fit out a formidable fleet.

The Algerines, undiſmayed by the threats of the French admiral, fitted out a fleet of 16 galleys and galliots, excellently manned and equipped, under the command of Admiral Hali Pinchinin.—The chief deſign of this armament was againſt the treaſure of Loretto; which, however, they were prevented by contrary winds from obtaining. Upon this they made a deſcent on Puglia in the kingdom of Naples; where they ravaged the whole territory of Necotra, carrying off a vaſt number of captives, and among them ſome nuns. From thence ſteering towards Dalmatia, they ſcoured the Adriatic; and loading themſelves with immenſe plunder, left thoſe coaſts in the utmoſt conſternation and reſentment.

39
Which is totally deſtroyed by the Venetians.

At laſt the Venetians, alarmed at ſuch terrible depredations, equipped a fleet of 28 ſail, under the command of admiral Capello, with expreſs orders to burn, ſink, or take, all the Barbary corſairs he met with, either on the open ſea, or even in the Grand Signior's harbours, purſuant to a late treaty of peace with the Porte. On the other hand, the captain baſhaw, who had been ſent out with the Turkiſh fleet to chaſe the Florentine and Malteſe cruiſers out of the Archipelago, underſtanding that the Algerine ſquadron was ſo near, ſent expreſs orders to the admiral to come to his aſſiſtance. Pinchinin readily agreed; but having firſt reſolved on a deſcent upon the iſland of Liſſa, or Liſina, na, belonging to the Venetians, he was overtaken by Capello, from whom he retired to Valona, a ſea-port belonging to the Grand Signior, whither the Venetian admiral purſued him; but the Turkiſh governor refuſing to eject the pirates according to the articles of the peace between the Ottoman court and Venice, Capello was obliged to content himſelf with watching them for ſome time. Pinchinin was ſoon weary of reſtraint, and ventured out; when an engagement immediately enſued, in which the Algerines were defeated, and five of their veſſels diſabled; with the loſs of 1500 men, Turks, and Chriſtian ſlaves; beſides 1600 galley-ſlaves who regained their liberty. Pinchinin, after this defeat, returned to Valona, where he was again watched by Capello; but the latter had not lain long at his old anchorage before he received a letter from the ſenate, deſiring him to make no farther attempt on the pirates at that time, for fear of a rupture with the Porte. This was followed by a letter from the governor of Valona, deſiring him to take care leſt he incurred the Sultan's diſpleaſure by ſuch inſults. The brave Venetian was forced to comply; but, reſolving to take ſuch a leave of the Algerines as he thought they deſerved, obſerved how they had reared their tents, and drawn their booty and equipage along the ſhore. He then kept firing among their tents, while ſome well-manned galliots and brigantines were ordered among their ſhipping, who attacked them with ſuch bravery, that, without any great loſs, they towed out their 16 galleys, with all their cannon, ſtores, &c.—In this laſt engagement, a ball from one of the Venetian galleys, happening to ſtrike a Turkiſh moſque, the whole action was conſidered as an inſult upon the Grand Signior. To conceal this, Capello was ordered to ſink all the Algerine ſhips he had taken, except the admiral; which was to be conducted to Venice, and laid up as a trophy. Capello came off with a ſevere reprimand; but the Venetians were obliged to buy, with 500,000 ducats, a peace from the Porte. The Grand Signior offered to repair the loſs of the Algerines by building ten galleys for them, upon condition that they ſhould continue in his ſervice till the end of the enſuing ſummer; but Pinchinin, who knew how little the Algerines choſe to lie under obligations to him, civilly declined the offer.

40
Algiers in the utmoſt confuſion at the news.

In the mean time, the news of this defeat and loſs filled Algiers with the utmoſt grief and confuſion. The whole city was on the point of a general inſurrection, when the baſhaw and douwan iſſued out a proclamation forbidding, not only complaints and outcries, under the ſevereſt penalties; but all perſons whatever to *take their thumbs from within their girdles*, while they were deliberating on this important point. In the mean time, they applied to the Porte for an order, that the Venetians ſettled in the Levant ſhould make up their loſs. But with this the Grand Signior refuſed to comply, and left them to repair their loſſes, as well as build new ſhips, in the beſt manner they could. It was not long, however, before they had the ſatisfaction to ſee one of their corſairs land, with a freſh ſupply of 600 ſlaves, whom he had brought from the coaſt of Iceland, whither he had been directed by a miſcreant native taken on board a Daniſh ſhip.

41
They ſet out a new fleet.

Our pirates did not long continue in their weak and defenceleſs ſtate; being able, at the end of two years, to appear at ſea with a fleet of 65 ſail. The admiral Pinchinin equipped four galliots at his own expence; with which, in conjunction with the Chiayah, or ſecretary of the baſhaw of Tripoli, he made a ſecond excurſion. This ſmall ſquadron, conſiſting of five galleys and two brigantines, fell in with an Engliſh ſhip of 40 guns; which, however, Pinchinin's captains refuſed to engage; but being afterwards reproached by him for their cowardice, they ſwore to attack the next Chriſtian ſhip which came in their way. This happened to be a Dutch merchantman, of 28 guns and 40 men, deeply laden, and unable to uſe her ſails by reaſon of a calm. Pinchinin immediately ſummoned her to ſurrender; but receiving an ironical anſwer, drew up his ſquadron in the form of a half-moon, that they might pour their ſhot all at once into their adverſary. This, however, the Dutchman avoided, by means of a breeze of wind which fortunately ſprung up and enabled him to turn his ſhip; upon which the galleys ran foul of each other.—Upon this Pinchinin ran his own galley along ſide of the merchantman, the upper deck of which 70 Algerines immediately took poſſeſſion of, ſome of them cutting the rigging, and others plying the hatches with hand-grenadoes: but the Dutchmen having ſecured themſelves in their cloſe quarters, began to fire at the Algerines on board, from two pieces of cannon loaded with ſmall ſhot; by which they were all ſoon killed, or forced to ſubmit. Pinchinin, in the mean time, made ſeveral unſucceſsful attempts to relieve his men, as well as to ſurround the Dutchman with his other galleys: but that ſhip lay ſo deep in the water, that every ſhot did terrible execution among the pirates; ſo that they were obliged to remove farther off. At laſt the Dutch captain, having ordered his guns to be loaded with cartouches, gave them ſuch a parting volley as killed 200 of them, and ſent the reſt back to Algiers in a moſt diſmal plight.

42
Five of their galleys defeated by a Dutchmerchantman.

But though Pinchinin thus returned in diſgrace, the reſt of the fleet quickly came back with vaſt numbers of ſlaves, and an immenſe quantity of rich ſpoils; inſomuch that the Engliſh, French, and Dutch, were obliged to cringe to the mighty Algerines, who ſometimes vouchſafed to be at peace with them, but ſwore eternal war againſt Spain, Portugal, and Italy, whom they looked upon as the greateſt enemies to the Mahometan name. At laſt Lewis XIV. provoked by the grievous outrages committed by the Algerines on the coaſts of Provence and Languedoc, ordered, in 1681, a conſiderable fleet to be fitted out againſt them, under the Marquis du Queſne, vice-admiral of France. His firſt expedition was againſt a number of Tripolitan corſairs; who had the good fortune to outrow him, and ſhelter themſelves in the iſland of Scio belonging to the Turks. This did not, however, prevent him from purſuing them thither, and making ſuch terrible fire upon them as quickly deſtroyed 14 of their veſſels, beſides battering the walls of the caſtle.

43
Preparations againſt Algiers by Lewis XIV

44
Algiers bombarded and ſet on fire by the French.

This ſeverity ſeemed only to be deſigned as a check to the piracies of the Algerines; but, finding they ſtill continued their outrages on the French coaſt, he ſailed to Algiers in Auguſt 1682, cannonading and bombarding it ſo furiouſly, that the whole town was in flames in a very little time. The great moſque was battered down, and moſt of the houſes laid in ruins, inſomuch that the inhabitants were on the point of abandoning the place; when on a ſudden the wind turned about,

and

45 Algerines commit dreadful ravages in France.

and obliged Du Queſne to return to Toulon. The Algerines immediately made repriſals, by ſending a number of galleys and galliots to the coaſts of Provence, where they committed the moſt dreadful ravages, and brought away a vaſt number of captives: upon which a new armament was ordered to be got ready at Toulon and Marſeilles againſt the next year; and the Algerines, having received timely notice, put themſelves into as good a ſtate of defence as the time would allow.

46 The city again bombarded.

In May 1683, Du Queſne with his ſquadron caſt anchor before Algiers; where being joined by the Marquis D'Affranville, at the head of five ſtout veſſels, it was reſolved to bombard the town next day. Accordingly 100 bombs were thrown into it the firſt day, which did terrible execution; while the beſieged made ſome hundred diſcharges of their cannon againſt them, without doing any conſiderable damage. The following nights the bombs were again thrown into the city in ſuch numbers, that the dey's palace and other great edifices were almoſt deſtroyed; ſome of their batteries were diſmounted, and ſeveral veſſels ſunk in the port. The dey and Turkiſh baſhaw, as well as the whole ſoldiery, alarmed at this dreadful havock, immediately ſued for peace. As a preliminary, the immediate ſurrender was inſiſted on of all Chriſtian captives who had been taken fighting under the French flag; which being granted, 142 of them were immediately delivered up, with a promiſe of ſending him the remainder as ſoon as they could be got from the different parts of the country. Accordingly Du Queſne ſent his commiſſary-general and one of his engineers into the town; but with expreſs orders to inſiſt upon the delivery of all the French captives without exception, together with the effects they had taken from the French; and that Mezomorto their then admiral, and Hali Rais one of their captains, ſhould be given as hoſtages.

This laſt demand having embarraſſed the dey, he aſſembled the douwan, and acquainted them with it: upon which Mezomorto fell into a violent paſſion, and told the aſſembly, that the cowardice of thoſe who ſat at the helm had occaſioned the ruin of Algiers; but that, for his part, he would never conſent to deliver up any thing that had been taken from the French. He immediately acquainted the ſoldiery with what had paſſed; which ſo exaſperated them, that they murdered the dey that very night, and on the morrow choſe Mezomorto in his place. This was no ſooner done, than he cancelled all the articles of peace which had been made, and hoſtilities were renewed with greater fury than ever.

47 Set on fire and almoſt deſtroyed.

The French admiral now kept pouring in ſuch volleys of bombs, that, in leſs than three days, the greateſt part of the city was reduced to aſhes, and the fire burnt with ſuch vehemence, that the ſea was enlightened with it for more than two leagues round. Mezomorto, unmoved at all theſe diſaſters, and the vaſt number of the ſlain, whoſe blood ran in rivulets along the ſtreets; or rather, grown furious and deſperate, ſought only how to wreak his revenge on the enemy; and, not content with cauſing all the French in the city to be cruelly murdered, ordered their conſul to be tied hand and foot, and faſtened alive to the mouth of a mortar, from whence he was ſhot away againſt their navy.—By this piece of inhumanity Du Queſne was ſo exaſperated, that he did not leave Algiers till he had utterly deſtroyed all their fortifications, ſhipping, almoſt all the lower part, and above two thirds of the upper part, of the city; by which means it became little elſe than a heap of ruins.

48 Algerines ſue for peace.

The haughty Algerines were now thoroughly convinced that they were not invincible; and, therefore, immediately ſent an embaſſy into France, begging in the moſt abject terms for peace; which Lewis immediately granted, to their inexpreſſible joy. They now began to pay ſome regard to other nations, and to be a little cautious how they wantonly incurred their diſpleaſure. The firſt bombardment by the French had ſo far humbled the Algerines, that they condeſcended to enter into a treaty with England; which was renewed, upon terms very advantageous to the latter, in 1686. It is not to be ſuppoſed, however, that the natural perfidy of the Algerines would diſappear on a ſudden: notwithſtanding this treaty, therefore, they loſt no opportunity of making prizes of the Engliſh ſhips when they could conveniently come at them. Upon ſome infringement of this kind, Captain Beach drove aſhore and burnt ſeven of their frigates in 1695; which produced a renewal of the treaty five years after: but it was not till the taking of Gibraltar and Port Mahon, that Britain could have a ſufficient check upon them to enforce the obſervation of treaties; and theſe have ſince proved ſuch reſtraints upon Algiers, that they ſtill continue to pay a greater deference to the Engliſh than to any European power.

49 Seven of their ſhips burnt by capt. Beach.

50 Expulſion of the Turkiſh baſhaw.

The preſent century furniſhes no very remarkable events with regard to Algiers; except the taking of the famed city of Oran from the Spaniards in 1708 (which however they regained in 1737), and the expulſion of the Turkiſh baſhaw, and uniting his office to that of the dey in 1710. This introduced the form of government which ſtill continues in Algiers.

51 Revenues, &c. of the Dey.

The dey is now abſolute monarch; and pays no other revenue to the Porte, than that of a certain number of fine boys or youths, and ſome other preſents which are ſent thither yearly. His own income, probably, riſes and falls according to the opportunities he hath of fleecing both natives and foreigners; whence it is variouſly computed by different authors. Dr Shaw computes the taxes of the whole kingdom to bring into the treaſury no more than 300,000 dollars; but ſuppoſes that the eighth part of the prizes, the effects of thoſe perſons who die without children, joined to the yearly contributions raiſed by the government, preſents from foreigners, fines and oppreſſions, may bring in about as much more. Both the dey, and officers under him, enrich themſelves by the ſame laudable methods of rapine and fraud; which it is no wonder to find the common people practiſing upon one another, and eſpecially upon ſtrangers, ſeeing they themſelves are impoveriſhed by heavy taxes and the injuſtice of thoſe who are in authority.

We have already hinted, that the firſt deys were elected by the militia, who were then called the *douwan*, or common-council. This elective body was at firſt compoſed of 800 militia-officers, without whoſe conſent the dey could do nothing; and upon ſome urgent occaſions, all the officers reſiding in Algiers, amounting to above 1500, were ſummoned to aſſiſt. But ſince the deys, who may be compared to the Dutch

52
Strange method of gathering the vote of the douwan.

Stadtholders, have become more powerful, the douwan is principally compoſed of 30 chiak-baſhaws, or colonels, with now and then the mufti and cadi upon ſome emergencies ; and, on the election of a dey, the whole ſoldiery are allowed to come and give their votes. All the regulations of ſtate ought to be determined by that aſſembly, before they paſs into a law, or the dey hath power to put them in execution : but, for many years back, the douwan is of ſo little account, that it is only convened out of formality, and to give aſſent to what the dey and his chief favourites have concerted beforehand. The method of gathering the votes in this auguſt aſſembly is perfectly agreeable to the character of thoſe who compoſe it. The aga, or general of the janiſaries, or the preſident *pro tempore*, firſt propoſes the queſtion ; which is immediately repeated with a loud voice by the chia-baſhaws, and from them echoed again by four officers called *baſhaldalas*, from theſe the queſtion is repeated from one member of the douwan to another, with ſtrange contortions, and the moſt hideous growlings, if it is not to their liking. From the loudneſs of this growling noiſe, the aga is left to gueſs as well as he can whether the majority of the aſſembly are pleaſed or diſpleaſed with the queſtion ; and from ſuch a prepoſterous method, it is not ſurpriſing that theſe aſſemblies ſhould ſeldom end without ſome tumult or diſorder. As the whole body of the militia is concerned in the election of a new dey, it is ſeldom carried on without blows and bloodſhed : but when once the choice is made, the perſon elected is ſaluted with the words ALLA BARICK, "God bleſs you, and proſper you ;" and the new dey uſually cauſes all the officers of the douwan who had oppoſed his election to be ſtrangled, filling up their places with thoſe who had been moſt zealous in promoting it. From this account of the election of the deys, it cannot be expected that their government ſhould be at all ſecure ; and as they arrive at the throne by tumult, diſorder, and bloodſhed, they are generally deprived of it by the ſame means, ſcarcely one in ten of them having the good fortune to die a natural death.

53
Puniſhments, &c.

In this country it is not to be expected that juſtice will be adminiſtered with any degree of impartiality. The Mahometan ſoldiery, in particular, are ſo much favoured, that they are ſeldom put to death for any crime, except rebellion ; in which caſe they are either ſtrangled with a bow-ſtring, or hanged to an iron hook. In leſſer offences, they are fined, or their pay ſtopped ; and if officers, they are reduced to the ſtation of common ſoldiers, from whence they may gradually raiſe themſelves to their former dignity. Women guilty of adultery, have a halter tied about their necks, with the other end faſtened to a pole, by which they are held under water till they are ſuffocated. The baſtinado is likewiſe inflicted for ſmall offences ; and is given either upon the belly, back, or ſoles of the feet, according to the pleaſure of the cadi ; who alſo appoints the number of ſtrokes. Theſe ſometimes amount to 200 or 300, according to the indulgence the offender can obtain either by bribery or friends ; and hence he often dies under this puniſhment, for want of powerful enough advocates. But the moſt terrible puniſhments are theſe inflicted upon the Jews or Chriſtians who ſpeak againſt Mahomet or his religion ; in which caſe, they muſt either turn Mahometan, or be impaled alive. If they afterwards apoſtatize, they are burned or roaſted alive, or elſe thrown down from the top of the city-walls, upon iron hooks, where they are caught by different parts of their body, according as they happen to fall, and ſometimes expire in the greateſt torments ; though by accident they may be put out of pain at once, as we have already related of the Spaniſh adventurer John Gaſcon. This terrible puniſhment, however, begins now to be diſuſed.

54
Aga of the janiſaries and other military officers.

The officer next in power to the dey is the aga of the janiſaries, who is one of the oldeſt officers in the army, and holds his poſt only for two months. He is then ſucceeded by the chiah, or next ſenior officer.—During the two months in which the aga enjoys his dignity, the keys of the metropolis are in his hands ; all military orders are iſſued out in his name ; and the ſentence of the dey upon any offending ſoldier, whether capital or not, can only be executed in the court of his palace.—As ſoon as he is gone through this ſhort office, he is conſidered as *mazoul*, or ſuperannuated ; receives his pay regularly, like the reſt of the militia, every two moons ; is exempt from all further duties, except when called by the dey to aſſiſt at the grand council, to which he hath, however, a right to come at all times but hath no longer a vote in it.—Next to the aga in dignity, is the ſecretary of ſtate, who regiſters all the public acts ; and after him, are the 30 chiahs, or colonels, who ſit next to the aga in the douwan, and in the ſame gallery with him. Out of this claſs are generally choſen thoſe who go embaſſadors to foreign courts, or who diſperſe the dey's orders throughout the realm.—Next to them are 800 bolluck-baſhaws, or eldeſt captains, who are promoted to that of chiah-baſhaws, according to their ſeniority. The oldack-baſhaws, or lieutenants, are next ; who amount to 400, and are regularly raiſed to the rank of captains in their turn, and to other employments in the ſtate, according to their abilities. Theſe, by way of diſtinction, wear a leather ſtrap, hanging down to the middle of their back. One rule is ſtrictly obſerved in the rotation of theſe troops from one deputy to a higher ; viz. the right of ſeniority ; one ſingle infringement of which would cauſe an inſurrection, and probably coſt the dey his life. Other military officers of note are the vekelards, or purveyors of the army ; the peys, who are the four oldeſt ſoldiers, and conſequently the neareſt to preferment ; the foulacks, who are the next in ſeniority to them, and are part of the dey's body-guards, always marching before him when he takes the field, and diſtinguiſhed by their carbines and gilt ſcymitars, with a braſs gun on their caps ; the kayts, or Turkiſh ſoldiers, each band of whom have the government of one or more adowars, or itinerant villages, and collect their taxes for the dey ; and the ſagiards, or Turkiſh lancemen, 100 of whom always attend the army, and watch over the water appointed for it. To theſe we may add the beys, or governors of the three great provinces of the realm. All the above-mentioned officers ought to compoſe the great douwan or council above-mentioned ; but only the 30 chiah-baſhaws have a right to ſit in the gallery next after the dey : The reſt are obliged to ſtand on the floor of the hall, or council-chamber, with their arms acroſs, and, as much as poſſible, without motion ; neither are they permitted to enter with their ſwords on, for fear of a tumult. As for thoſe who have any matters to tranſact with the douwan, they muſt ſtand without, let the weather be ever ſo bad; and there they are commonly preſented with coffee by ſome of the inferior officers, till they are diſmiſſed.

55 Diviſion of the kingdom. The kingdom of Algiers is at preſent divided into three provinces or diſtricts, viz. the eaſtern, weſtern, and ſouthern. The eaſtern, or Levantine government, which is by far the moſt conſiderable of the three, and is alſo called *Beylick*, contains the towns of Boano, Conſtantina, Gigeri, Bujeyah, Steſſa, Tebeſ, Zamoura, Biſcara, and Necanz, in all which the Turks have their garriſons: beſides which, it includes the two ancient kingdoms of Cuco and Labez, though independent of the Algerine government, to whoſe forces their country is inacceſſible; ſo that they ſtill live under their own cheyks choſen by each of their adowars or hords. To theſe we may add a French factory at Calle, under the direction of the company of the French Baſtion.—The weſtern government hath the towns of Oran, Tremecen, Moſtagan, Tenez, and Secrelly with its caſtle and garriſon.—The ſouthern government hath neither town, village, nor even a houſe, all the inhabitants living in tents, which obliges the bey and his forces to be always encamped.

56 Rivers. The moſt conſiderable rivers of Algiers are the Zha, or Ziz, which runs acroſs the province of Tremecen, and the deſart of Anguid, falling into the Mediterranean near the town of Tabecrita, where it has the name of *Sirut*. (2.) The Haregol, ſuppoſed the *Sign* of Ptolemy, comes down from the great Atlas, croſſes the deſart of Anguid, and falls into the ſea, about five leagues from Oran. (3.) The Mina, ſuppoſed the *Chylematis* of Ptolemy, a large river, which runs through the plains of Bathala, and falls into the ſea near the town of Arzew. This river hath lately received the name of *Cena*, who rebuilt the town of Bathalah after it had been deſtroyed. (4.) The Sheliff, Zilef, or Zilif, deſcending from the mount Gnanexeris, runs through ſome great deſarts, the lake Titteri, the frontiers of Tremecen and Tenez, falling into the ſea a little above the city of Moſtagan. (5.) The Celef, ſuppoſed to be the *Carthena* of the ancients, falls into the ſea about three leagues weſt of Algiers, after a ſhort courſe of 18 or 20 leagues. (6.) The Hued-alquivir, ſuppoſed to be the *Nalabata*, or *Naſaba*, of the ancients, and called by the Europeans *Zinganir*, runs down with a ſwift courſe, through ſome high mountains of Cuco, and falls into the ſea near Bujeyah.
57 Harbour of Bujeyah cleared by accident. Whilſt the city of Bujeyah was in the hands of the Chriſtians, the mouth of this river was ſo choaked up with ſand, that no veſſel could come up into it: but in 1555, very ſoon after it was taken by the Moors, the great rains ſwelled it to ſuch a degree, that all the ſand and mud was carried off; ſo that galleys, and other veſſels, have ever ſince entered it with eaſe, where they lie ſafe from ſtorms, and all winds, but that which blows from the north. (7.) Suf-Gemar or Suf-Gimmar al Rumniel, ſuppoſed to be the *Ampſaga* of Ptolemy, hath its ſource on mount Auras, on the confines of Atlas; thence runs through ſome barren plains, and the fruitful ones of Conſtantina, where its ſtream is greatly increaſed by ſome other rivers it receives; from thence running northward, along the ridges of ſome high mountains, it falls into the ſea a little eaſt of Gigeri. (8.) The Ladag, or Ludeg, runs down from mount Atlas through part of Conſtantina, and falls into the ſea a little eaſtward of Bona. (9.) Guadi, or Guadel Barbar, ſprings from the head of Orbus, or Urbs, in Tripoli, runs through Bujeyah, and falls into the ſea near Tabarea.

58 Account of the corſairs commerce, &c. Beſides theſe there are many others of leſs note; of which, however, we do not find that the Algerines avail themſelves as they might do, their genius leading them too much to the piratical trade to mind any real advantage that might be derived from their own country. The corſairs, or pirates, form each a ſmall republic, of which the rais or captain is the ſupreme baſhaw; who, with the officers under him, form a kind of douwan, in which every matter relating to the veſſel is decided in an arbitrary way. Theſe corſairs are chiefly inſtrumental in importing whatever commodities are brought into the kingdom either by way of merchandize or prizes. Theſe conſiſt chiefly of gold and ſilver ſtuffs, damaſks, cloths, ſpices, tin, iron, plated braſs, lead, quickſilver, cordage, ſail-cloth, bullets, cochineal, linen, tartar, alum, rice, ſugar, ſoap, cotton raw and ſpun, copperas, aloes, brazil and logwood, vermilion, &c. Very few commodities, however, are exported from this part of the world: the oil, wax, hides, pulſe, and corn produced, being but barely ſufficient to ſupply the country; though, before the loſs of Oran, the merchants have been known to ſhip off from one or other of the ports of Barbary ſeveral thouſand tons of corn. The conſumption of oil, though here in great abundance, is likewiſe ſo conſiderable in this kingdom, that it is ſeldom permitted to be ſhipped off for Europe. The other exports conſiſt chiefly in oſtriches feathers, copper, ruggs, ſilk ſaſhes, embroidered handkerchiefs, dates and Chriſtian ſlaves. Some manufactures in ſilk, cotton, wool, leather, &c. are carried on in this country, but moſtly by the Spaniards ſettled here, eſpecially about the metropolis. Carpets are alſo a manufacture of the country, which, though much inferior to thoſe of Turkey, both in beauty and fineneſs, are preferred by the people to lie upon, on account of their being both cheaper and ſofter. There are alſo, at Algiers, looms for velvet, taffaties, and other wrought ſilks; and a coarſe ſort of linen is likewiſe made in moſt parts of the kingdom. The country furniſhes no materials for ſhip-building. They have neither ropes, tar, ſails, anchors, nor even iron. When they can procure enough of new wood to form the main timbers of a ſhip, they ſupply the reſt from the materials of prizes which they have made; and thus find the ſecret of producing new and ſwift ſailing veſſels from the ruins of the old. Of all the ſtates on the coaſt of Barbary, the Algerines are the ſtrongeſt at ſea.

58 Inhabitants. The inhabitants along the ſea-coaſts are a mixture of different nations; but chiefly Moors and Moreſcos driven out of Catalonia, Arragon, and other parts of Spain. Here are alſo great numbers of Turks, who come from the Levant to ſeek their fortune; as well as multitudes of Jews and Chriſtians taken at ſea, who are brought hither to be ſold for ſlaves. The Berebers are ſome of the moſt ancient inhabitants of the country; and are ſuppoſed to be deſcended from the ancient Sabeans, who came hither from Arabia Felix, under the conduct of one of their princes. Others be-

lieve them to be ſome of the Canaanites driven out of Paleſtine by Joſhua. Theſe are diſperſed all over Barbary, and divided into a multitude of tribes under their reſpective chiefs: moſt of them inhabit the mountainous parts; ſome range from place to place, and live in tents, or portable huts; others in ſcattered villages: they have, nevertheleſs, kept themſelves for the moſt part from intermixing with other nations. The Berebers are reckoned the richeſt of all, go better clothed, and carry on a much larger traffic of cattle, hides, wax, honey, iron, and other commodities. They have alſo ſome artificers in iron, and ſome manufactures in the weaving branch.—The name of *Bereber* is ſuppoſed to have been originally given them on account of their being firſt ſettled in ſome deſart place. Upon their increaſing in proceſs of time, they divided themſelves into five tribes, probably on account of religious differences, called the *Zinhagians, Muſamedins, Zeneti, Hoares,* and *Gomeres;* and theſe having produced 600 families, ſubdivided themſelves into a great number of petty tribes.—To theſe we may add the *Zwowahs,* by European authors called *Azuagues,* or *Aſſagues,* who are likewiſe diſperſed over moſt parts of Barbary and Numidia. Great numbers of theſe inhabit the mountainous parts of Cuco, Labez, &c. leading a wandering paſtoral life.—But the moſt numerous inhabitants are the Moors and Arabians. The former are very ſtout and warlike, and ſkilful horſemen; but ſo addicted to robbing, that one cannot ſafely travel along the country at a diſtance from the towns without a guard, or at leaſt a marabout or ſaint for a ſafeguard. For as they look upon themſelves to be the original proprietors of the country, and not only as diſpoſſeſſed by the reſt of the inhabitants, but reduced by them to the loweſt ſtate of poverty, they make no ſcruple to plunder all they meet by way of repriſal. The inhabitants, in general, have a pretty fair complexion; they are robuſt and well proportioned. People of diſtinction wear their beards: they have rich clothes made of ſilk, embroidered with flowers of gold, and turbans enriched with jewels. The Turks, who compoſe the military force, have great privileges, pay no taxes, are never publicly puniſhed, and rarely in private. The loweſt ſoldier domineers over the moſt diſtinguiſhed Moors at pleaſure. If he finds them better mounted than himſelf, he exchanges horſes without ceremony. The Turks alone have the privilege of carrying fire-arms. Many good qualities, however, diſtinguiſh them in ſpite of this exceſs of deſpotiſm. They never game for money, nor even for trifles; and they never profane the name of the Deity. They ſoon forget their private quarrels; and after the firſt paroxyſm of reſentment is over, it is infamy for a Turk to keep in remembrance the injuries he has received. In this reſpect certainly they are leſs barbarous than other nations that boaſt of their civilization. See MOORS.

ALGIERS, a city, the capital of the above kingdom, is probably the ancient *Icoſium:* by the Arabians called *Algezair,* or rather *Al-Jezier,* or *Al-Jezerah,* i. e. *the iſland,* becauſe there was an iſland before the city, to which it hath been ſince joined by a mole. It is built on the declivity of a hill by the ſea-ſide, in the form of an amphitheatre: at ſea, it looks like the topſail of a ſhip. The tops of the houſes are quite flat and white; inſomuch, that when it is firſt diſcovered, one would take it to be a place where they bleach linen. One houſe riſes above another in ſuch a manner that they do not hinder each other's proſpect. The ſtreets are ſo narrow, that they will ſcarce admit two perſons to walk a-breaſt, and the middle part is lower than the ſides. When any loaded beaſts, ſuch as camels, horſes, mules, or aſſes, paſs along, you are forced to ſtand up cloſe to the wall to let them paſs by. There is but one broad ſtreet, which runs through the city from eaſt to weſt, in which are the ſhops of the principal merchants, and the market for corn and other commodities. The lower part of the walls of the city are of hewn ſtone, and the upper part of brick; they are 30 feet high on the land ſide, and 40 towards the ſea; the foſſes or ditches are twenty feet broad, and ſeven deep. There is no ſweet water in the city: and tho' there is a tank or ciſtern in every houſe, yet they often want water, becauſe it rains but ſeldom: the chief ſupply is from a ſpring on a hill, the water of which is conveyed by pipes to above a hundred fountains, at which a bowl is faſtened for the uſe of paſſengers. The common reſervoir is at the end of the mole, where the ſhips take in their water. Every one takes his turn at theſe places, except the Turks, who are firſt, and the Jews laſt. There are five gates, which are open from ſun-riſing till ſun-ſetting; and ſeven forts, or caſtles, without the walls, the greateſt of which is on the mole without the gate, all of which are well ſupplied with great guns. There are ten large moſques, and fifty ſmall ones; three great colleges or public ſchools, and a great number of petty ones for children. The houſes are ſquare, and built of ſtone and brick, with a ſquare court in the middle, and galleries all round. There are ſaid to be about 100,000 inhabitants in the city, comprehending 5000 Jewiſh families, beſides Chriſtians. There are four fundics, or public inns, ſuch as are in Turkey; and ſix cazernes, or barracks, for the unmarried Turkiſh ſoldiers, which will hold 600 each. There are no inns for Chriſtians to lodge at; but only a few tippling huts kept by ſlaves, for the accommodation of Greeks and the poorer ſort of travellers, where any thing may be had for money. Here are bagnios, or public baths, in the ſame manner as in Turkey, at a very moderate rate. The women have baths of their own, where the men dare not come. Without the city there are a great number of ſepulchres, as alſo cells or chapels, dedicated to marabouts, or reputed ſaints, which the women go to viſit every Friday. The Turkiſh ſoldiers are great tyrants; for they not only turn others out of the way in the ſtreets, but will go to the farm-houſes in the country for twenty days together, living on free quarters, and making uſe of every thing, not excepting the women. The Algerines eat, as in Turkey, ſitting croſs-legged round a table about four inches high, and uſe neither knives nor forks; before they begin, every one ſays *Be iſme Allah,* "In the name of God." When they have done, a ſlave pours water on all their hands as they ſit, and then they waſh their mouths. Their drink is water, ſherbet, and coffee. Wine is not allowed, though drank immoderately by ſome. The proſpect of the country and ſea from Algiers is very beautiful, being built on the declivity of a mountain; but the city, though for ſeveral ages it has braved ſome of the greateſt powers in Chriſtendom, it is ſaid, could make but a faint defence againſt a regular ſiege; and that three Engliſh fifty-gun ſhips might batter it about the ears of its inhabitants from the harbour. If ſo, the Spaniards muſt have been very deficient either in courage or conduct. They attacked it in the year 1775, by land and by ſea, but were repulſed with great loſs; though they had near 20,000 foot and 2000 horſe, and 47 king's ſhips of different rates and 346 tranſports. In the year 1783 and 1784, they alſo renewed their attacks by ſea to deſtroy the city and galleys; but after ſpending a quantity of ammunition, bombs, &c. were forced to retire without either its capture or extinction. The mole of the harbour is 500 paces in length, extending from the continent to a ſmall iſland where there is a caſtle and large battery. E. Long. 3. 30. N. Lat. 36. 40.

ALGOL, a fixed ſtar of the third magnitude, called *Meduſa's Head*, in the conſtellation Perſeus; its longitude is 21° 50′ 42″ of Taurus, and its latitude 23° 23′ 47″ north; according to Flamſtead's catalogue. For an account of its changes, period, and other circumſtances. See ASTRONOMY (*Index*).

ALGONQUINS, a nation in North America, who formerly poſſeſſed great tracts of land along the north ſhore of the river St Lawrence. For a long time they had no rivals as hunters and warriors, and were long in alliance with the Iroquois; whom they agreed to protect from all invaders, and to let them have a ſhare of their veniſon. The Iroquois, on the other hand, were to pay a tribute to their allies, out of the culture of the earth; and to perform for them all the menial duties, ſuch as flaying the game, curing the fleſh, and dreſſing the ſkins. By degrees, however, the Iroquois aſſociated in the hunting matches and warlike expeditions of the Algonquins; ſo that they ſoon began to fancy themſelves as well qualified, either for war or hunting, as their neighbours. One winter, a large detachment of both nations having gone out a-hunting, and ſecured, as they thought, a vaſt quantity of game, ſix young Algonquins and as many Iroquois were ſent out to begin the ſlaughter. The Algonquins, probably, became a little jealous of their aſſociates, upon ſeeing a few elks, deſired the Iroquois to return, on pretence that they would have ſufficient employment in flaying the game they ſhould kill; but after three days hunting, having killed none, the Iroquois exulted, and in a day or two privately ſet out to hunt for themſelves. The Algonquins were ſo exaſperated at ſeeing their rivals return laden with game, that they murdered all the hunters in the night-time. The Iroquois diſſembled their reſentment; but in order to be revenged, applied themſelves to ſtudy the art of war as practiſed among thoſe ſavage nations. Being afraid of engaging with the Algonquins at firſt, they tried their prowеſs on other inferior nations, and, when they thought themſelves ſufficiently expert, attacked the Algonquins with ſuch diabolical fury, as ſhowed they could be ſatisfied with nothing leſs than the extermination of the whole race; which, had it not been for the interpoſition of the French, they would have accompliſhed.—The few Algonquin nations that are now to be ſeen, ſeem entirely ignorant of agriculture, and ſubſiſt by fiſhing and hunting. They allow themſelves a plurality of wives; notwithſtanding which, they daily decreaſe in populouſneſs, few or none of their nations containing above 6000 ſouls, and many of them not 2000. Their language is one of the three radical ones in North America, being underſtood from the river St Lawrence to the Miſſiſſippi.

ALGOR, with phyſicians, an unuſual coldneſs in any part of the body.

ALGORITHM, an Arabic word, expreſſive of numerical computation.

ALGUAZIL, in the Spaniſh polity, an officer whoſe buſineſs it is to ſee the decrees of a judge executed.

ALHAGI, in botany, the trivial name of a ſpecies of hedyſarum. See HEDYSARUM.

ALHAMA, a very pleaſant town of the kingdom of Granada, in Spain, ſituated in the midſt of ſome craggy mountains, about 25 miles S. W. of Granada, on the banks of the Rio Frio, in W. Long. 1. 10. N. Lat. 36. 59. and having the fineſt warm baths in all Spain. It was taken from the Moors in 1481. The inhabitants, though ſurpriſed, and the town without a garriſon, made a gallant defence: but being at length forced to ſubmit, the place was abandoned to the pillage of the Chriſtian ſoldiers; who, not ſatisfied with an immenſe quantity of gold and jewels, made ſlaves of upwards of 3000 of the inhabitants.

ALHAMBRA, the ancient fortreſs and reſidence of the Mooriſh monarchs of Granada. It derives its name from the red colour of the materials which it was originally built with, Alhambra ſignifying a red houſe. It appears to the traveller a huge heap of as ugly buidings as can well be ſeen, all huddled together, ſeemingly without the leaſt intention of forming *one* habitation out of them. The walls are entirely unornamented, all gravel and pebbles, daubed over with plaſter by a very coarſe hand: yet this is the palace of the Mooriſh kings of Granada, indiſputably the moſt curious place within that exiſts in Spain, perhaps in the world. In many countries may be ſeen excellent modern as well as ancient architecture, both entire and in ruins; but nothing to be met with any where elſe can convey an idea of this edifice, except the decorations of an opera, or the tales of the genii.

Paſſing round the corner of the emperor's palace, one is admitted at a plain unornamented door in a corner. On my firſt viſit, ſays Mr Swinburne, I confeſs I was ſtruck with amazement, as I ſtept over the threſhold, to find myſelf on a ſudden tranſported into a ſpecies of fairy land. The firſt place you come to is the court called the *communa* or *del meſucar*, that is the *common baths*; an oblong ſquare, with a deep baſon of clear water in the middle; two flights of marble ſteps leading down to the bottom; on each ſide a parterre of flowers, and a row of orange-trees. Round the court runs a periſtile paved with marble; the arches bear upon very ſlight pillars, in proportions and ſtyle different from all the regular orders of architecture. The ceilings and walls are incruſtated with fret work in ſtucco, ſo minute and intricate, that the moſt patient draughtſman would find it difficult to follow it, unleſs he made himſelf maſter of the general plan. This would facilitate the operation exceedingly; for all this work is frequently and regularly repeated at certain diſtances, and has been executed by means of ſquare moulds applied ſucceſſively, and the parts joined together with the utmoſt nicety. In every diviſion are Arabic ſentences of different lengths, moſt

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of them expreſſive of the following meanings: "There is no conqueror but God;" or, "Obedience and honour to our Lord Abouabdoula." The ceilings are gilt or painted, and time has cauſed no diminution in the freſhneſs of their colours, though conſtantly expoſed to the air. The lower part of the walls is Moſaic, diſpoſed in fantaſtic knots and feſtoons. A work ſo novel, ſo exquiſitely finiſhed, and ſo different from all that he had ever ſeen, muſt afford a ſtranger the moſt agreeable ſenſations while he treads this magic ground. The porches at the ends are more like grotto-work than any thing elſe to which they can be compared. That on the right hand opens into an octagon vault, under the emperor's palace, and forms a perfect whiſpering gallery, meant to be a communication between the offices of both houſes.

Oppoſite to the door of the communa through which you enter, is another leading into the *quarto de les leones*, or apartment of the lions; which is an oblong court, 100 feet in length and 50 in breadth, environed with a colonnade 7 feet broad on the ſides, and 10 at the end. Two porticoes or cabinets about 15 feet ſquare, project into the court at the two extremities. The ſquare is paved with coloured tiles; the colonnade with white marble. The walls are covered five feet up from the ground with blue and yellow tiles, diſpoſed chequerwiſe. Above and below is a border of ſmall eſcutcheons, enamelled blue and gold, with an Arabic motto on a bend; ſignifying, "No conqueror but God." The columns that ſupport the roof and gallery are of white marble, very ſlender, and fantaſtically adorned. They are 9 feet high, including baſe and capital, and 8½ inches diameter. They are very irregularly placed; ſometimes ſingly, at others in groupes of three, but more frequently two together. The width of the horſe-ſhoe arches above them is four feet two inches for the large ones, and three for the ſmaller. The ceiling of the portico is finiſhed in a much finer and more complicated manner than that of the communa, and the ſtucco laid on the walls with inimitable delicacy; in the ceiling it is ſo artfully froſted and handled as to exceed belief. The capitals are of various deſigns, though each deſign is repeated ſeveral times in the circumference of the court, but not the leaſt attention has been paid to placing them regularly or oppoſite to each other. Not the ſmalleſt repreſentation of animal life can be diſcovered amidſt the varieties of foliages, groteſques, and ſtrange ornaments. About each arch is a large ſquare of arabeſques, ſurrounded with a rim of characters, that are generally quotations from the Koran. Over the pillars is another ſquare of delightful filligree work. Higher up is a wooden rim, or kind of cornice, as much enriched with carving as the ſtucco that covers the part underneath. Over this projects a roof of red tiles, the only thing that disfigures this beautiful ſquare. This ugly covering is modern, put on by order of Mr Wall, the late prime miniſter, who a few years ago gave the Alhambra a thorough repair. In Mooriſh times, the building was covered with large painted and glazed tiles, of which ſome few are ſtill to be ſeen. In the centre of the court are twelve ill-made lions muzzled, their fore parts ſmooth, their hind parts rough, which bear upon their backs an enormous baſon, out of which a leſſer riſes. While the pipes were kept in good order, a great volume of water was thrown up, that, falling down into the baſons, paſſed through the beaſts, and iſſued out of their mouths into a large reſervoir, where it communicated by channels with the jet d'eaus in the apartments. This fountain is of white marble, embelliſhed with many feſtoons and Arabic diſtiches, thus tranſlated:

"Seeſt thou not how the water flows copiouſly like the Nile?"

"This reſembles a ſea waſhing over its ſhores, threatening ſhipwreck to the mariner."

"This water runs abundantly, to give drink to the lions."

"Terrible as the lion is our king in the day of battle."

"The Nile gives glory to the king, and the lofty mountains proclaim it."

"This garden is fertile in delights; God takes care that no noxious animal ſhall approach it."

"The fair princeſs that walks in this garden, covered with pearls, augments its beauty ſo much, that thou may'ſt doubt whether it be a fountain that flows, or the tears of her admirers."

Paſſing along the colonnade, and keeping on the ſouth ſide, you come to a circular room uſed by the men as a place for drinking coffee and ſorbets in. A fountain in the middle refreſhes the apartment in ſummer. The form of this hall, the elegance of its cupola, the cheerful diſtribution of light from above, and the exquiſite manner in which the ſtucco is deſigned, painted, and finiſhed, exceed all powers of deſcription. Every thing in it inſpires the moſt pleaſing, voluptuous ideas; yet in this ſweet retreat they pretend that Abouabdoulah aſſembled the Abencerrages, and cauſed their heads to be ſtruck off into the fountain. Continuing your walk round, you are next brought to a couple of rooms at the head of the court, which are ſuppoſed to have been tribunals, or audience chambers.

Oppoſite to the *Sala de los Abencerrages*, is the entrance into the *Torre de las dos hermanas*, or the tower of the two ſiſters; ſo named from two very beautiful pieces of marble laid as flags in the pavement. This gate exceeds all the reſt in profuſion of ornaments, and in beauty of proſpect which it affords through a range of apartments, where a multitude of arches terminate in a large window open to the country. In a gleam of ſunſhine, the variety of tints and lights thrown upon this enfilade are uncommonly rich. The firſt hall is the concert-room, where the women ſat; the muſicians played above in four balconies. In the middle is a jet d'eau. The marble pavement is equal to the fineſt exiſting, for the ſize of the flags and evenneſs of the colour. The two ſiſters, which give name to the room, are ſlabs that meaſure 15 feet by 7½, without flaw or ſtain. The walls, up to a certain height, are Moſaic, and above are divided into very neat compartments of ſtucco, all of one deſign, which is alſo followed in many of the adjacent halls and galleries. The ceiling is a fretted cove. To preſerve this vaulted roof, as well as ſome of the other principal cupolas, the outward walls of the towers are raiſed 10 feet above the top of the dome, and ſupport another roof over all, by which means no damage can ever be cauſed by wet weather or exceſſive heat and cold. From this hall you paſs round the little myrtle-garden of Lindaraxa, into an additional building made to the eaſt end by Charles V. The rooms are ſmall and low. His dear motto, *Plus ultra*, appears on every beam. This leads to a little tower, projecting from the line of the north wall, called *El tocador*, or the dreſſing-room of the ſultana. It is a ſmall ſquare cabinet, in the middle of an open gallery, from which it receives light by a door and three windows. The look-out is charming. In one corner is a large marble flag, drilled full of holes, through which the ſmoke of perfumes aſcended from furnaces below; and here, it is preſumed, the Mooriſh queen was wont to ſit to fumigate and ſweeten her perſon. The emperor cauſed this pretty room to be painted with repreſentations of his wars, and a great variety of groteſques, which appear to be copies, or at leaſt imitations, of thoſe in the loggie of the Vatican. From hence you go through a long paſſage to the hall of ambaſſadors, which is magnificently decorated with innumerable varieties of moſaics, and the mottos of all the kings of Granada. This long narrow antichamber opens into the communa on the left hand, and on the right into the great audience-hall in the tower of Comares; a noble apartment, 36 feet ſquare, 36 high up to the cornice, and 18 from thence to the centre of the cupola. The walls on three ſides are 15 feet thick, on the other 9; the lower range of windows 13 feet high. The whole wall is inlaid with moſaic of many colours, diſpoſed in intricate knots, ſtars, and other figures. In every part various Arabic ſentences are repeated.

Having thus completed the tower of the upper apartments, which are upon a level with the offices of the new palace, you deſcend to the lower floor, which conſiſted of bedchambers and ſummer-rooms; the back-ſtairs and paſſages, that facilitated the intercourſe between them, are without number. The moſt remarkable room below is the king's bedchamber, which communicated, by means of a gallery, with the upper ſtory. The beds were placed in two alcoves, upon a raiſed pavement of blue and white tiles; but as it was repaired by Philip V. who paſſed ſome time here, it cannot be ſaid how it may have been in former times. A fountain played in the middle, to refreſh the apartment in hot weather. Behind the alcoves are ſmall doors, that conduct you to the royal baths. Theſe conſiſt of one ſmall cloſet with marble ciſterns for waſhing children, two rooms for grown up perſons, and vaults for boilers and furnaces that ſupplied the baths with water and the ſtoves with vapours. The troughs are formed of large ſlabs of white marble; the walls are beautified with party-coloured earthen ware; light is admitted by holes in the coved ceiling.

Hard by is a whiſpering gallery, and a kind of labyrinth, ſaid to have been made for the diverſion of the women and children. One of the paſſages of communication is fenced off with a ſtrong iron gate, and called *the priſon of the ſultana;* but it ſeems more probable that it was put up to prevent any body from climbing up into the womens quarter.

Under the council-room is a long ſlip, called *the king's ſtudy*: and adjoining to it are ſeveral vaults, ſaid to be the place of burial of the royal family. In the year 1574, four ſepulchres were opened; but as they contained nothing but bones and aſhes, were immediately cloſed again.

This deſcription of the Alhambra may be finiſhed by obſerving how admirably every thing was planned and calculated for rendering this palace the moſt voluptuous of all retirements; what plentiful ſupplies of water were brought to refreſh it in the hot months of ſummer; what a free circulation of air was contrived, by the judicious diſpoſition of doors and windows; what ſhady gardens of aromatic trees; what noble views over the beautiful hills and fertile plains! No wonder the Moors regretted Granada; no wonder they ſtill offer up prayers to God every Friday for the recovery of this city, which they eſteem a terreſtrial paradiſe. See GRANADA.

ALI, gives the denomination to a ſect, or diviſion, among the Mahometans, who adhere to the right of ſucceſſion of Ali the fourth caliph or ſucceſſor of Mahomet, and to the reform of Muſſulmaniſm introduced by him. The ſectaries of Ali are more particularly called *Schiites;* and ſtand oppoſed to the *Sunnites*, or ſect of Omar, who adhere to the law as left by Mahomet, Abubeker, and Omar. Ali was couſin of Mahomet, and ſon-in-law of that prophet, having married his daughter Fatimah. After Mahomet's death, great diſputes aroſe about the ſucceſſion. Many ſtood for Ali; but Abubeker was preferred, and elected the firſt kalif. Ali took his turn, after the death of Othman.—The Perſians are the chief adherents to the ſect of Ali, whom they hold to have been the legitimate ſucceſſor of Mahomet, and Abubeker an uſurper. On the contrary, the Turks are of the ſect of Omar; and hold Ali in execration, having raiſed a furious civil war among the Muſſulmans. The diſtinguiſhing badge of the followers of Ali is a red turban, which is worn by the Perſians, who are hence called in deriſion, by the Turks, *Kiſilbachi*, q. d. *red-heads*. Ali is reputed the author of ſeveral works, particularly a Centiloquium, in great eſteem among the Arabs and Perſians, part of which has been publiſhed in Engliſh by Mr Ockley.

ALJAMEIA is a name which the Moriſcoes in Spain give to the language of the Spaniards. Among other articles agreed on by the junto, which was appointed by the emperor Charles V. in 1526, in favour of the Moriſcoes, this was one, That the Moriſcoes ſhould no longer ſpeak Algavareia, i. e. Mooriſh or Arabic; but ſhould all ſpeak *Aljameia*, i. e. Spaniſh, as it was called by the Moors, and all their writings and contracts ſhould be in that language.

ALIAS, in law, a ſecond or farther writ iſſued from the courts of Weſtminſter, after a *capias*, &c. ſued out without effect.

ALIBI, in law, denotes the abſence of the accuſed from the place where he is charged with having committed a crime; or his being *elſewhere*, as the word imports, at the time ſpecified.

ALICANT, a large ſea-port town in the province of Valencia and territory of Segura. It is ſeated between the mountains and the ſea, and has a caſtle deemed impregnable. The port is defended by three baſtions furniſhed with artillery. To prevent the viſits of the Algerine pirates, watch-towers were built to give notice of the approach of an enemy's ſhip. It was taken from the Moors in 1264. The caſtle was taken by the Engliſh in 1706, and held out a ſiege of two years before it was retaken by the French and Spaniards, and at laſt ſurrendered upon honourable terms, after part of the rock was blown up on which the caſtle ſtood, and the governor killed. The houſes are high, and well built; and a very great trade is carried on here, particularly in wine and fruit. It is ſeated in the Mediterranean, on a bay of the ſame name, 37 miles north-eaſt of Murcia, and 75 ſouth of Valencia. W. Long. 0. 36. N. Lat. 38. 24.

ALICATA, a mountain of Sicily, near the valleys Mazara and Noto, upon which was ſituated (as is generally thought) the famous Dædalion, where the tyrant Phalaris kept his brazen bull.

Alicata, a town of Sicily, remarkable for corn and good wine. It was plundered by the Turks in 1543; and is ſeated on a ſort of peninſula near the ſea, twenty-two miles S. E. of Girgenti. E. Long. 15. 20. N. Lat. 37. 11.

Alicata Chlamys, was a ſort of veſt with ſleeves, worn by the Roman boys till the age of thirteen, at which time they put on the *prætexta*.

ALIEN, in law, implies a perſon born in a ſtrange country not within the king's allegiance; in contradiſtinction to a denizen, or natural ſubject. The word in formed from the Latin *alius*, "another"; *q. d.* one born in another country. An alien is incapable of inheriting lands in Britain till naturalized by an act of parliament. No alien is intitled to vote at the election of members of parliament; nor can he enjoy any office, or be returned on any jury, unleſs where an alien is party in a cauſe, when the inqueſt is compoſed of an equal number of denizens and aliens. The reaſons for eſtabliſhing theſe laws were, that every man is preſumed to bear faith and love to that prince and country where he received protection during his infancy; and that one prince might not ſettle ſpies in another's country; but chiefly, that the rents and revenues of the country might not be drawn to the ſubjects of another. Some have thought that the laws againſt aliens were introduced in the time of Henry II. when a law was made at the parliament of Wallingford, for the expulſion of ſtrangers, in order to drive away the Flemings and Picards introduced into the kingdom by the wars of King Stephen. Others have thought that the origin of this law was more ancient; and that it is an original branch of the feudal law: for by that law no man can purchaſe any lands but he muſt be obliged to do fealty to the lords of whom the lands are holden; ſo that an alien who owed a previous faith to another prince, could not take an oath of fidelity in another ſovereign's dominions. Among the Romans, only the *Cives Romani* were eſteemed freemen; but when their territories increaſed, all the Italians were made free, under the name of *Latins*, tho' they had not the privilege of wearing gold rings till the time of Juſtinian. Afterwards all born within the pale of the empire were conſidered as citizens.

Alien-Duty, an impoſt laid on all goods imported by aliens, over and above the cuſtoms paid for ſuch goods imported by Britiſh, and on Britiſh bottoms.

Aliens-Duty is otherwiſe called *petty cuſtoms*, and *navigation-duty*.—Fiſh dried or ſalted, and cod-fiſh or herring not caught in Britiſh veſſels and cured by Britiſh, pay a double *aliens-duty*.—On what footing aliens are permitted to import foreign commodities into Great Britain, ſee Duty.

Alien-Priories, a kind of inferior monaſteries, formerly very numerous in England, and ſo called from their belonging to foreign abbeys.

ALIENATION, in law, denotes the act of making over a man's property in land, tenements, &c. to another perſon.

Alienation in mortmain, is making over lands, tenements, &c. to a body-politic, or to a religious houſe, for which the king's licence muſt firſt be obtained, otherwiſe the lands &c. alienated will be forfeited.

Alienation in fee, is the ſelling the fee-ſimple of any land, or other incorporeal right. All perſons who have a right to lands may generally alien them to others; but ſome alienations are prohibited: ſuch as alienations by tenants for life, &c. whereby they incur a forfeiture of their eſtate. By the ſtatute of Edward I. a bar was put to alienations by what we call *entails*, which is an expedient for procuring perpetuities in families; but counter expedients were deviſed to defeat this intent, and a practice was introduced of cutting off entails by fines, and of barring remainders and reverſions by recoveries. The ſtatute for alienations in Henry VII's. time had a great effect on the conſtitution of England; as, among other regulations of that reign, it tended to throw the balance of power more into the hands of the people. By the ſtat. 12 Car. II. cap. 24. fines for alienations are taken away. Crown lands are only alienable under a faculty of perpetual redemption. The council of Lateran, held in 1123, forbids any clerk to alienate his benefice, prebend, or the like. By the laws of the ancient Jews, land could only be alienated for the ſpace of 50 years. At each return of the jubilee all returned again to the primitive owners, or their deſcendents, to whom the lands were originally allotted at the firſt diſtribution of Canaan.

Alienation-Office, is an office to which all writs of covenants and entry, upon which fines are levied, and recoveries ſuffered, are carried, to have fines for alienation ſet and paid thereon.

ALIMENT, (from *alo*, to nouriſh), implies food both ſolid and liquid: from which, by the proceſs of digeſtion, is prepared a very mild, ſweet, and whitiſh liquor, reſembling milk, and diſtinguiſhed by the name of *chyle*; which being abſorbed by the lacteal veins, by them conveyed into the circulation, and there aſſimilated into the nature of blood, affords that ſupply of nutrition which the continual waſte of the body is found to require.—Next to air, food is the moſt neceſſary thing for the preſervation of our bodies: and as on the choice thereof our health greatly depends, it is of great importance to underſtand, in general, what is the propereſt for our nouriſhment; and, in particular deviations from health, what is the beſt adapted to reſtore us. Our blood and juices naturally incline to become putrid and acrimonious: freſh chyle, duly received, prevents this deſtructive tendency, and preſerves them in that mild ſtate which alone conſiſts with health. An animal diet affords the moſt of this bland nutritious mucilage; watery fluids dilute the too groſs parts, and carry off what is become unfit for uſe. It is only the ſmall portion of jelly which is ſeparated from the farinaceous parts of vegetables, that, after being much elaborated, is converted into the animal nature; yet the uſe of vegetables prevents both repletion and a too great tendency to a putreſcent acrimony of the blood. In hot climates, as well as againſt the conſtitutional heat of particular perſons, vegetables are demanded in the largeſt portion; animal ſubſtances afford the higheſt reliſh while our appetite continues; but will ſate the appetite before the ſtomach is duly filled. Vegetables may be eaten after either fleſh or fiſh: few herbs or fruits ſatiate ſo much as that the ſtomach may not be filled with them, when it is already ſatisfied with fleſh or fiſh; whence it may be obſerved that no diet which is very nouriſhing can be eat to fulneſs, becauſe its nutritious parts are oily and ſatiating. Health depends almoſt wholly on a proper craſis of the blood; and to preſerve this a mixture of vegetables in ſome degree is always required, for a loathing is ſoon the conſequence of animal food alone: hot acrid habits, too, receive from milk and vegetables what is needful for correcting their exceſſes; but in cold, pituitous, and nervous habits, who want moſt nouriſhment from leaſt digeſtion, and from the ſmalleſt quantity of food, animal diet is to be uſed more freely.

Thus much being offered as general principles with reſpect to the matter and quality of our aliment, the valetudinarian may eaſily regulate his diet with ſome advantage to himſelf by an attention to the few enſuing particulars. In winter, eat freely, but drink ſparingly: roaſt meat is to be preferred, and what is drank ſhould be ſtronger than at other ſeaſons. In ſummer, let thirſt determine the quantity to be drunk; cold ſtomachs never require much: boiled meats and vegetables, if not otherwiſe contradicted, may now be more freely uſed. Lax habits require the winter's diet to be continued all the year, and rigid ones ſhould be confined to that of ſummer. Fat people ſhould faſt at times, but the lean ſhould never do ſo. Thoſe who are troubled with eructations occaſioned by their food, ſhould drink but little, and uſe ſome unaccuſtomed exerciſe. The thirſty ſhould drink freely, but eat ſparingly. In general, let moderation be obſerved; and tho' no dinner hath been had, a light ſupper is at all times to be preferred. After very high-ſeaſoned meats, a glaſs of water acidulated with the acid elixir of vitriol, or in very weak ſtomachs the ſweet elixir of vitriol, is far more aſſiſtant to the work of digeſtion than the common method of taking brandy. See, further, Food and Drink.

Obligation of Aliment, in Scots law, the natural obligation on parents to provide their children with the neceſſaries of life, &c. See Law, Part III. Nº clxxiii. 4.

Alimentarii Pueri, &c. were certain children maintained and educated by the munificence of the emperors, in a ſort of public places, not unlike our hoſpitals.—Trajan was the firſt that brought up any of theſe *alimentary* boys. He was imitated by Adrian. Antoninus Pius did the ſame for a number of maids, at the ſolicitation of Fauſtina; and hence, in ſome medals of that empreſs, we read PVELLAE FAVSTINANAE.—Alexander Severus did the like at the requeſt of Mammæa; and the maids thus educated were called Mammæanæ.

Alimentary Duct or *Canal*, is a name given by Dr Tyſon and ſome others to that part of the body thro' which the food paſſes, from its reception into the mouth to its exit at the *anus*; including the *gula*, ſtomach, and inteſtines. See Anatomy.

This duct has been ſaid to be the true characteriſtic of an animal, or (in the jargon of the ſchools) *in proprium quarto modo;* there being no animal without it, and whatever has it being properly enough ranged under the claſs of animals. Plants receive their nouriſhment by the numerous fibres of their roots, but have no common receptacle for digeſting the food received, or for carrying off the recrements. But in all, even the loweſt degree of animal life, we may obſerve a ſtomach and inteſtines, even where we cannot perceive the leaſt formation of any organ of the ſenſes, unleſs that common one of feeling as in oyſters. Phil. Tranſ. Nº 269, p. 776, ſeq.

Dr Wallis brings an argument from the ſtructure of the alimentary tube in man, to prove that he is not naturally carnivorous; To which Dr Tyſon makes ſome objections. V. Phil. Tranſ. Nº 269, p. 777.

Alimentary Law, lex alimentaria, was an old law among the Romans, whereby children were obliged to find ſuſtenance from their parents.

ALIMONY, in law, implies that allowance which a married woman ſues for, and is entitled to, upon any occaſional ſeparation from her huſband. See Law, Part III. Nº clx. 13.

ALIPILARIUS, or Alipilus, in Roman antiquity, a ſervant belonging to the baths, whoſe buſineſs it was, by means of waxen plaſters, and an inſtrument called *volſella*, to take off the hairs from the arm-pits, and even arms, legs, &c, this being deemed a point of cleanlineſs.

ALIPTERIUM, αλειπτηριον, in antiquity, a place in the ancient *paleſtræ*, where the *athletæ* were anointed before their exerciſes.

ALIQUANT part, in arithmetic, is that number which cannot meaſure any other exactly without ſome remainder. Thus 7 is an aliquant part of 16; for twice 7 wants two of 16, and three times 7 exceeds 16 by 5.

ALIQUOT part, is that part of a number or quantity which will exactly meaſure it without any remainder. Thus 2 is an aliquot part of 4; 3 of 9; 4 of 16, &c.

ALISANDERS, or Alexanders, in botany. See Smyrnium.

ALISMA, or Water-Plantain: A genus of the polygynia order, belonging to the hexandria claſs of plants; and in the natural method ranking under the 5th order, *Tetrapetaloideæ.* The characters are: The *calyx* is a three leaved perianthium: The *corolla* conſiſts of three roundiſh, large, flat, expanding petals: The *ſtamina* conſiſt of ſix ſubulated filaments ſhorter than the corolla; the antheræ are roundiſh: The *piſtillum* conſiſts of more than five germina; the ſtyli are ſimple, the ſtigmata obtuſe: The *pericarpium* conſiſts of compreſſed capſulæ: The *ſeeds* are ſmall and ſolitary. Of this genus there are eight

Species, viz. The plantago, or great water-plantain, which grows in all the marſhy parts of Britain; the ranunculoides, or leſſer water-plantain; the natans, or creeping water-plantain; the damaſonium, or ſtar-headed water-plantain; all which are natives of Britain. The others, *viz.* the flava, cordifolia, ſubulata, and parnaſſifola, are natives of America, where they are generally found in ſtagnating waters, and other ſwampy places; ſo that it would be difficult to preſerve them in Britain, for they will not live in the open air, and they require a bog to make them thrive: but as they are plants of no great beauty or uſe, it is ſcarcely worth while to cultivate them.

ALISONTIA, or ALISUNTIA, (anc. geog.); a river of Belgic Gaul, now *Alſitz*; which riſing on the borders of Lorrain, and running through the duchy, waters the city of Luxemburg, and ſwelled by other rivulets, falls into the Sur.

ALITES, in Roman antiquity, a deſignation given to ſuch birds as afforded matter of auguries by their flight.

ALKADARII, a ſect among the Mahometans who deny any eternal, fixed, divine decrees, and are aſſerters of free will. The word is formed from the Arabic *alkadar*, which ſignifies "decree." The Alkadarii are a branch of Motazalites, and ſtand oppoſed to the Algiabarii. See ALGIABARII.

ALKAHEST, or ALCAHEST, in chemiſtry, an univerſal menſtruum capable of reſolving all bodies into their firſt principles. Van Helmont pretended he was poſſeſſed of ſuch a menſtruum; but, however credulous people might be impoſed on in his days, the notion is now become as ridiculous as the philoſopher's ſtone, the perpetuum mobile, &c.—It is likewiſe uſed by ſome authors for all fixed ſalts volatilized.

ALKALI, in chemiſtry, one of the general diviſions of ſalts, comprehending that claſs of chemical elements which, by their union with acids, form *perfect neutrals*, in oppoſition to the ſalts formed of acids, with metals or earths, which are called *imperfect*.

Alkaline ſalts are divided into two kinds, the fixed and volatile; and the former into two ſpecies, vegetable, and mineral or foſſil. All of theſe poſſeſs ſome properties in common, and ſome peculiar to each.

1
Properties common to all the alkaline ſalts.

Thoſe which they have in common are, 1. An acrid and pungent taſte, which, when the ſalts are very pure and ſtrong, degenerates into abſolute cauſticity, and would entirely deſtroy the organ of ſenſation if long applied to it. 2. A tendency to diſſolve animal ſubſtances, and to reduce them to a gelatinous ſubſtance, which all of them will do when very ſtrong. 3. An attraction for acids, with a power of ſeparating earths and metals from them, though previouſly combined with the ſame. 4. They change the blue vegetable juices to green; the green to yellow; the yellow to orange; the orange to red; and the red to purple. 5. They unite with oils, and deſtroy or cauſe to fade almoſt all kinds of colours that can be put upon cloth, whence their uſe in bleaching, &c.

2
Properties common to the two fixed alkalis.

The properties common to both kinds of fixed alkalis are, 1. They reſiſt the action of fire to a great degree, ſo that they can eaſily be reduced to a ſolid form by evaporating any liquid in which they happen to be diſſolved. 2. By an intenſe fire, they flow into a liquid which concretes into an hard and ſolid maſs in the cold. 3. When mixed in certain proportions with thoſe earths or ſtones called *vitrifiable*, they melt, in a heat ſtill more intenſe, into glaſs. 5. Mixed with ammoniacal ſalts, with animal ſubſtances, or with ſoot, they extricate a volatile alkali.

3
Of the volatile alkali

The volatile alkali differs from the other two in being unable to reſiſt the fire, and being entirely reſolvable into an inviſible and permanently elaſtic fluid, called by Dr Prieſtley *alkaline air*. In conſequence of this volatility, it always affects the olfactory nerves very perceptibly, and its ſmell is the general criterion by which its ſtrength may be judged of. Its attraction for acids, power of changing colours, &c. are alſo conſiderably weaker than thoſe of the fixed alkalis.

Though two ſorts of volatile alkali are commonly ſold under the names of ſpirits of hartſhorn and of ſal-ammoniac, the one differs from the other only in its degree of purity. The former is ſo called from its being originally made from the horns of deer; but this material has been long laid aſide, and the bones of horſes, the *flints*, as they are called, of the horns of cattle, the parings of hoofs, &c. have been ſubſtituted in their ſtead. This kind, however carefully prepared, always contains a portion of animal oil, the ſmell of which is very perceptible; the other, prepared from pure ſal ammoniac, is totally free from any empyreumatic ſmell, and is as pure as it can be obtained by any means whatever.

4
Effervеſcence with acids not a characteriſtic of alkali.

Effervеſcence with acids was formerly ſuppoſed to be a diſtinguiſhing property of alkalis, though it was always known that by a mixture with quicklime they might be deprived of this property. Dr Black, however, has ſhown that the effervеſcing with acids is no property of pure alkali, but is occaſioned only by the eſcape of fixed air from it: of conſequence, when quicklime is added, which attracts the whole or greateſt part of the fixed air, no effervеſcence can be perceived. In the ſtate in which the fixed alkalis are commonly met with, indeed, effervеſcence with acids may be ſaid to be an eſſential property; but this is entirely owing to the cauſe juſt mentioned, *viz.* a quantity of fixed air, to which they are united during the proceſs by which they were originally formed. The quantity of this air, however, is never ſo great as to ſaturate them entirely; on the contrary, their alkaline properties are always very perceptible, and they are commonly ſaid to be in a *mild* ſtate. But the truth is, that now they are in a kind of intermediate ſtate between what may be called perfectly mild and perfectly cauſtic. In their perfectly mild ſtate, they are united with ſuch a large quantity of fixed air as entirely overpowers their alkaline properties; and therefore they are no more intitled to the name of alkalis in this ſtate, than when combined with the marine, nitrous, or any other acid; in which caſe the compounds are called neutral ſalts. But it is a much more laborious and tedious proceſs to ſaturate an alkali completely with fixed air than with any other acid; nor does it very eaſily retain the aerial acid after it has once been combined with it. Hence the cauſtic taſte and properties of the alkali almoſt always predominate, and the ſalt contains a portion of pure and cauſtic alkali, to which alone its virtues are to be aſcribed.

5
Preparation of the vegetable alkali.

Vegetable alkali is obtained in its greateſt purity by deflagrating nitre with charcoal, provided we make uſe of no more of the latter than is barely ſufficient to deſtroy the nitrous acid. It is, however, a very difficult matter to adjuſt this proportion with ſufficient accuracy; for if we employ too much charcoal, the ſalt will be conſiderably phlogiſticated; if too little, ſome part of the nitre will remain undecompoſed. Burnt tartar therefore, purified by ſolution and filtration, may be looked upon as the beſt alkali we have. The common alkalis, or *aſhes* as they are called, and ſaid to be obtained from the aſhes of vegetables, are always mixed with much phlogiſton, and ſometimes with lime, ſalt or other heterogeneous matters; for which reaſon they are not to be employed in the nicer chemical experiments, without being purified by ſolution in water, by filtration, and cryſtallization. The pureſt of all theſe ſalts is that called the *blue pearl*, imported from Hungary.

6 Its peculiar properties.

The vegetable alkali when thus purified, and containing near one half its weight of fixed air, is of a white colour when dry, with a very hot and cauſtic taſte, poſſeſſing in an eminent degree all thoſe qualities which have been aſcribed to the alkaline ſalts in general. It runs *per deliquium* when expoſed to the air; and is uſually incapable of being cryſtallized, though it acquires this property after being employed in the rectification of ardent ſpirit. It adheres more cloſely to acids than any ſubſtance hitherto diſcovered; though, from ſome experiments, Bergman was induced to believe that pure terra ponderoſa attracted acids ſtill more powerfully. But this has been diſcovered to be a miſtake by Dr Withering, who, in a paper publiſhed in the 74th volume of the Philoſophical Tranſactions, ſhows, that unleſs where the earth is united with vitriolic acid, not only the vegetable, the foſſil, but even the volatile alkali, in its pure or cauſtic ſtate, will ſeparate it from any other with which it may be combined. Terra ponderoſa, therefore, will always decompoſe vitriolated tartar, Glauber's ſalt, or vitriolic ammoniac; whence the miſtake of this celebrated chemiſt probably has proceeded. After this alkali has been once united with marine acid, it appears to have undergone ſome change; for the ſalt then produced, by combining it with the vitriolic acid, reſembles Glauber's ſalt almoſt as much as it does vitriolated tartar. It ſeems therefore to have made ſome approach towards the nature of foſſil alkali; but chemiſts have not inquired what would be the conſequence of repeated combinations of this kind.

7 Of the foſſil alkali.

The foſſil alkali differs from the vegetable in having a ſmaller attraction for acids, in being more eaſily fuſible by itſelf, and forming a more ſoluble compound with the vitriolic acid. It is alſo eaſily cryſtallizable, even without the addition of more fixed air than it naturally contains: and experience has determined it to be more proper for glaſs or ſoap manufactures than the vegetable alkali; for which reaſon the demand for it is very conſiderable.

8 This alkali known to the ancients.

The foſſil alkali was anciently called *natron* or *nitre*, and is ſpoken of by Pliny and Tacitus as an ingredient in glaſs, &c. and the ſcriptures inform us that it was uſed in baths. The knowledge of this ſalt was loſt in the general obſcuration of ſcience which took place on the decline of the Roman empire; nor do we find it mentioned till the time of the Hon. Robert Boyle; and, even ſince that time, though M. du Hamel gave an accurate account of it in a memoir for the year 1736, little farther notice was taken of it till very lately.

9 Found native in many parts of the world.

We are now certainly informed that the foſſil alkali is found native in many parts of the world, which never is the caſe with the vegetable alkali. The places where it abounds moſt are, Egypt, the country of Tripoli in Barbary, the peak of Teneriffe in one of the Canary iſlands, Hungary, ſeveral of the provinces of Ruſſia, ſome parts of Aſia, particularly the neighbourhood of Smyrna, &c. though it has not hitherto been found in any of the weſtern countries of Europe, excepting in the neighbourhood of vulcanoes, or in mineral waters; and in theſe laſt only in very ſmall quantity.

10 Is the baſis of common ſalt.

The great ſource of the mineral alkali, however, and from whence it is not improbable that the places already mentioned have been ſupplied by ſome unknown natural operation, is the water of the ocean. Foſſil alkali is the natural baſis of ſea-ſalt; and could any method of readily procuring it from this ſalt be fallen upon, it would no doubt be a moſt valuable ſecret. Hitherto, however, all the methods uſed with any ſucceſs by the chemiſts may be reduced to two. 1. By mixing the nitrous acid with ſea-ſalt in a retort, in the proportion, according to Dr Vogel, of four of the acid to one of the ſalt, and diſtilling off the muriatic acid, or rather aqua regia, which will be produced in the proceſs. The reſiduum will afford a cubical nitre by cryſtallization, from whence the alkali may be obtained pure by deflagrating with charcoal. 2. By addition of vitriolic acid the ſpirit of ſea-ſalt will be expelled much more eaſily, and at a cheaper rate, than by the nitrous acid. The reſiduum affords Glauber's ſalt in great plenty; this being melted in a crucible with a ſufficient quantity of charcoal-duſt, forms a hepar ſulphuris; which being decompoſed by means of the vegetable acid, the latter may be deſtroyed by force of fire, and the alkali obtained in purity. For a further explication of both theſe methods, ſee the article Chemistry, *Index*.

The demand in England for foſſil alkali is ſupplied from the aſhes of alkali and other ſea plants, from which it is ſeparated in the ſame manner as the vegetable alkali from the aſhes of other plants. The pureſt kind of aſhes containing this ſalt is called *ſoda* or *barilla*, and is imported chiefly from foreign countries; that which is obtained from ſea-weed growing on their own coaſts, and known by the name of *kelp*, is exceſſively impure, and ſcarce admits of being thoroughly analyſed according to the rules of chemiſtry.

11 Properties of both fixed alkalis when cauſtic.

Both theſe alkalis may be deprived of their fixed air, and thus rendered pure and cauſtic, by the addition of quicklime. In this ſtate the difference between them is much leſs perceptible than in any other, though the addition of fixed air, or any other acid, always ſhows that no eſſential change has taken place in either. In this highly cauſtic ſtate they deſtroy the parts of animals in a manner ſimilar to that of fire; whence they are called *potential* cauteries, as the former is called the *actual* cautery. M. Morveau informs us, that on digeſting a piece of beef in a ſolution of cauſtic vegetable alkali, the liquor ſoon became red, and the fleſh aſſumed the form of a ſemitranſparent jelly, in which, however, one could eaſily perceive the ramifications of the ſmalleſt fibre; and, after ſtanding ſome months, it emitted but very little ſmell. The vegetable alkali is commonly made uſe of as the material for the common cauſtic or *lapis infernalis* of the ſhops; for the preparation of which, ſee Chemistry, *Index*. Both alkalis attract moiſture from the air when reduced to a ſolid form in their cauſtic ſtate, though neither the foſſil alkali nor its combinations do ſo in any other caſe. In their cauſtic ſtate alſo they only unite with oils, or diſſolve in ſpirit of wine; which laſt they have been ſuppoſed to purify, though it is more than probable that they decompoſe and communicate diſagreeable qualities to it.

12 Volatile alkali in its mild and cauſtic ſtates.

The volatile alkali, when procured immediately by the diſtillation of any ſubſtance capable of yielding it, is obtained in a ſtate ſimilar to that in which the alkalis are uſually met with, viz. half mild and half cauſtic. By expoſing the liquid alkali to a great quantity of fixed air, we may at laſt have it perfectly mild and neutralized, in which ſtate it appears as a white ſalt extremely volatile, though leſs ſo than the pure cauſtic alkali. It diſſolves very readily in water; but unleſs ſome cauſtic ſpirit, or ſome lime, or fixed alkali be added, in order to abſtract part of the fixed air, it will ſcarcely exhibit the characteriſtic of volatile alkali, viz. a pungent and urinous ſmell. The addition of fixed air, however, makes very little difference with regard to the chemical combinations of this ſalt; for as fixed air has a very ſlender power of acidity, it is expelled by every other acid with the greateſt eaſe, and the ſame combinations formed as though it had not been preſent. The only difference is, that when a mild alkali is added to an acid, a ſtrong effervеſcence takes place by reaſon of the eſcape of the fixed air through the liquid, while with the cauſtic alkali the mixture is made quietly and without diſturbance.

The various combinations of the alkaline ſalts with the different acids, and the neutral compounds thence reſulting, are exhibited in the following table.

1. Vegetable fixed alkali combined with

Vitriolic acid	forms	Vitriolated tartar.
Nitrous acid		Nitre.
Marine acid		Sal digeſtivus.
Acetous acid		Terra foliata tartari.
Acid of tartar		Soluble tartar.
Acid of borax Acid of phoſphorus, Saccharine acid, &c.		Anomalous ſalts, whoſe properties have not been aſcertained.
Aerial acid		Mild or aerated alkali.

2. Foſſil or mineral fixed alkali combined with

Vitriolic acid	forms	Glauber's ſalt.
Nitrous acid		Cubical nitre.
Marine acid		Common ſalt.
Acetous acid		A ſalt reſembling terra foliata tartari, but which does not deliquate.
Acid of tartar		Rochelle ſalt.
Acid of borax		Borax.
Acid of phoſphorus Saccharine acid, &c.		Unknown ſalts.
Aerial acid		Mild foſſil alkali.

3. Volatile alkali combined with

Vitriolic acid	forms	Vitriolic ammoniac, or Glauber's ſecret ſal ammoniac.
Nitrous acid		Nitrous ammoniac, or volatile nitre.
Marine acid		Common ſal ammoniac.
Acetous acid		Spiritus mindereri.

Volatile alkali combined with

Acid of tartar	forms	A ſalt whoſe properties have not been inveſtigated; which ſhoots into fine long cryſtals, and does not deliquate in the air.
Acid of borax		An anomalous ſalt.
Acid of phoſphorus		Microcoſmic ſalt, or eſſential ſalt of urine.
Saccharine acid, &c.		Anomalous ſalts.
Aerial acid		Volatile ſal ammoniac, or ſalt of hartſhorn.

13 Attractions of the alkalis for vinous ſubſtances.

Beſides their attraction for acids, the alkalis have alſo an attraction for oils, ſulphur, and ſpirits of wine, in the moiſt way, when the ſalts are deprived of their fixed air; and in this, as well as the dry way, with ſeveral metals, and vitrifiable earths and ſtones, as has been already mentioned.

With oil the vegetable fixed alkali forms a ſoap, though leſs perfect than that made with the cauſtic mineral alkali. When combined with fixed air they ſcarcely unite with oils. Boiled with ſulphur, or melted with it in their dry ſtate, they unite into a very fetid compound called *hepar ſulphuris*, which is ſoluble in water, but totally and very quickly decompoſed by the contact of air. Vegetable alkali unites with iron, tin, and zinc; corrodes copper, and runs with it into a liquor of a deep blue colour, and joins with lead in fuſion. It does not act upon gold in its metallic ſtate; but if a ſufficient quantity be added to a ſolution of gold in aqua regia, the calx of the metal will be firſt precipitated and afterwards diſſolved.

Vegetable alkali is a principal ingredient in the powders called *fluxes*, uſed for the fuſion of metalline ores. It promotes the fuſion of earths, and forms glaſs with the cryſtalline kind. It is ſoluble in an equal weight of diſtilled water; and, when expoſed to the air, it ſoon attracts moiſture from it and flows into a liquid. In its cauſtic ſtate it diſſolves in ſpirits of wine, and forms with it a red tincture called *Van Helmont's tincture of ſalt of tartar*, formerly uſed both as an internal and external remedy, but now fallen into diſrepute.

Foſſil alkali in its cauſtic ſtate unites with oil into an harder ſoap than that made with vegetable alkali. With ſulphur it forms a hepar ſulphuris in the ſame manner as the vegetable alkali, and yields a tincture with ſpirit of wine, which diſſolves part of the ſalt whilſt hot, but lets it fall again in a cryſtalline form when cold. Gold, ſilver, or quickſilver, are not affected by a ſolution of this ſalt; but copper and tin are diſſolved by it in the open air. It affects tin, lead, regulus of antimony, and cobalt, ſlightly; but acts powerfully upon zinc, and forms a kermes mineral with crude antimony. Copper, iron, biſmuth, zinc, antimony, and regulus of cobalt, fuſed with two parts of foſſil alkali, are almoſt entirely diſſolved in a very ſtrong heat; but tin, lead, and regulus of antimony, treated in the ſame manner, only ſuffer a partial ſolution.

All the alkalis are of conſiderable uſe in medicine, though

14 Medical virtues of alkaline ſalts.

though the particular virtues of vegetable and foſſil alkali have not hitherto been properly aſcertained. It is probable, however, that there muſt be a conſiderable diverſity in their operations on the human body, as the vegetable alkali ſhows itſelf ſo much more acrid and powerful than the foſſil. As both of them unite immediately with acids, and change them into mild neutral ſalts; hence, if any of the ſtrong mineral acids ſhould fall upon any part of the human body, and begin to corrode and give pain, the immediate application of the lixivium tartari, or of a ſolution of any of thoſe alkaline ſalts in water, or of the ſalts themſelves in powder, will deſtroy their cauſticity, and prevent their doing further miſchief: Or if any of theſe acids ſhould drop on clothes, linen, or other ſubſtances, and alkaline ſalts are immediately applied, they will neutralize the acid, and prevent its further corroſion: Or if a perſon ſhould, through miſtake, ſwallow any of the mineral acids, or corroſive ſublimate, or any other corroding ſalt which an alkali will decompoſe, the taking down into the ſtomach ſolutions of the alkaline ſalts, or the ſalts themſelves in proper doſes, are the moſt likely means of affording relief, if not given too late (A).

Both the vegetable and foſſil alkali applied externally in a cauſtic ſtate, firſt irritate and inflame the ſkin, and afterwards act as fire in mortifying and deſtroying it; and therefore have been much uſed by ſurgeons for opening buboes and other abſceſſes, and for eating away proud or fungous fleſh that ſprouts out from ſores. Various formulæ of cauſtic alkalis have been employed for theſe purpoſes, of which an account is given under CHEMISTRY and PHARMACY.

The alkaline ſalts, when much diluted with water, have been uſed as waſhes for removing pimples from the face; but if ſuch waſhes are continued long, they are apt to ſpoil the ſkin. The ancients often uſed to diſſolve natron (the foſſil alkali) in their baths, and eſteemed ſuch baths uſeful for removing itchings of the ſkin, the ſcab, the impetigo, leproſy, and almoſt all ſorts of cutaneous eruptions; and they employed baths of the ſame kind for promoting ſweat, and for curing various diſorders. They mixed it likewiſe with turpentine, with oils, and with ſtuffs of various kinds, and rubbed or applied ſuch compoſitions to the ſkin, for removing different complaints, to heal ſores, to ſtrengthen weak or relaxed parts, to deſtroy the poiſon of the bite of a mad dog, and of ſerpents: and they eſteemed it as an antidote againſt many other poiſons. It has been proved that alkaline ſalts preſerve animal ſubſtances from putrefaction; on which account ſome practitioners have concluded that they act as ſtrong antiſeptic remedies when ſwallowed as medicines, and are taken up by the lacteal veſſels, and by them carried to the ſubclavian vein to be mixed with the blood. Experience, however, has ſhown that they have effects directly oppoſite, and that by ſtimulating the veſſels and quickening the circulation, they contribute towards the diſſolution of the vital fluid; of which Dr Monro ſays he has ſeen ſeveral inſtances.

15 Do not act as antiſeptics when taken into the human body.

Alkalis promote the ſecretions in general, particularly by the kidneys; but by the help of warm liquors and bed-clothes, their operation may be directed towards the ſkin. They have alſo been employed in caſes of heartburn, and others where an acid prevails in the ſtomach and bowels, or where theſe organs are loaded with viſcid phlegm. They are likewiſe given with a view to aſſiſt the operation of the bile when it is too weak and inert, either by themſelves, or mixed with purgative or other medicines. The foſſil alkali has been alleged to be a more powerful ſolvent of the human calculus than the vegetable, though perhaps without any juſt foundation. It is given from 5 to 20 grains three times a day; and in ſome caſes even to double that quantity. It may be taken in any common liquor, or in clean broth made of lean meat, from which the fat has been ſkimmed off; or the powdered ſalts may be made up into pills or boluſes mixed with liquorice powder, by means of mucilage of gum Arabic or conſerve.

17 Are of conſiderable uſe in dropſies.

The vegetable alkali has long been uſed as a diuretic in dropſies with great ſucceſs; and Dr Monro informs us, that he has ſeen a number of caſes of anaſarca in which the water was carried off by it. As diuretics, it may be taken from ten grains to half a drachm, or more, two or three times a-day, mixed with ſome diſtilled water, ſyrup, broth, or water-gruel, or with two ounces of white-wine, which partly neutralizes the ſalt. When added to infuſions of juniper-berries, broom-tops, horſe-radiſh, muſtard-ſeed, winter's-bark, &c. in wine and beer, they prove powerful diuretics; and Dr Monro gives the following formula.

“Take broom-tops, horſe-radiſh, and juniper-berries, of each an ounce; bruiſe them in a ſtone or marble mortar; put them into a large wide-mouthed bottle, and add to them an ounce of ſalt of tartar and two quarts of Rheniſh wine. Infuſe them for four days; decant off the wine, and filter it through paper for uſe. Two or three ounces may be taken three or four times a-day.”

Or, “Take an ounce of canella alba, and as much muſtard-ſeed and juniper-berries; bruiſe them well in an iron mortar, and add an ounce of purified vegetable alkali with two quarts of porter: infuſe for four days, and filter the liquor through paper; let the patient take a wine-glaſs full every four or ſix hours.”

The diuretic powers of theſe medicines are ſometimes increaſed by opium, and they have been ſucceſsfully joined with eſſential oils and balſams.

17 An excellent ſolvent of the ſtone.

The moſt remarkable property of theſe ſalts, however, is that of diſſolving the human calculus; for the diſcovery of which, Mrs Stephens, in the year 1740, obtained a parliamentary reward of 5000l. At that time Dr Jurins being afflicted with the ſtone, tried a number of experiments on theſe medicines; from which he concluded, that their efficacy depended entirely on the

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(A) With regard to the mineral acids, an exception ſeems to take place if oil of vitriol in its concentrated ſtate ſhould happen to be ſwallowed; for this contracts ſuch a degree of heat on the contact of any aqueous fluid as would deſtroy the patient, independent of another cauſe. An inſtance we have ſeen where a perſon unhappily miſtook a bottle of oil of vitriol for water in the night-time. He recovered by ſwallowing inſtantly a great quantity of milk. Another recovered by drinking a bottle of Florence oil.

the alkaline ſalts and lime which they contained; and therefore he began to try what effects a ſoap-ley would have on himſelf. At firſt he took only a few drops, but gradually increaſed his doſe till he came to an ounce, and ſometimes an ounce and a half, in a proper vehicle, in 24 hours. This produced the diſcharge of ſome ſmall calculi, and relieved him of the ſymptoms of the ſtone. Dr Hartley, likewiſe, laboured under this complaint; and believing that the efficacy of Mrs Stephen's medicines depended on the ſoap, lime, and alkaline ſalts which they contained, ordered a paſte to be prepared for himſelf, made of eight ounces of ſoap, one of oyſter-ſhell lime, a drachm of ſalt of tartar, and as much water as formed the whole into a ſoft maſs; of which he took large quantities, and found himſelf greatly relieved, though not cured, as a ſtone was found in his bladder after his death. Theſe and other inſtances of ſucceſs, ſoon brought the medicines into general uſe: but though many found relief from them, others, particularly thoſe who were afflicted with the ſtone, had all the ſymptoms of their diſtemper aggravated, by the ſalts rendering the blood, and other liquors of the body, particularly the urine, ſharp and acrid, ſo as to irritate and inflame the bladder, which was already in too irritable a ſtate, from the conſtant friction of the calculus lodged within it. The late experiments of Mr Scheele and Sir Torbern Bergman, however, have made it evident, that the human calculus is compoſed of a concrete acid joined to a ſmall portion of animal earth. Moſt people, therefore, who are afflicted with the ſtone or gravel, wiſh to try the efficacy of theſe remedies, rather than ſubmit to the dangerous operation of lithotomy; we ſhall therefore ſubjoin, from Dr Monro, the following directions for making and uſing the ſoap-ley.

18
Monro's directions for making and uſing the ſoap-ley.

"Take of ſalt of tartar, eight ounces; of freſh quicklime, four ounces; of diſtilled water, a quart: mix them all well together in a large bottle, and let them ſtand for 24 hours; then pour off the ley and filter it through paper, keeping it in well-ſtopped vials for uſe. Of this the doſe is from 30 drops to three or four drachms, which is to be repeated two or three times in the day.

"One of the beſt methods of taking this ley is, to mix the quantity to be uſed in the day with three pints of plain broth, which has been made with the lean part of veal, with all the fat or oily parts ſeparated from it, by putting it, when made, into a large bowl, and ſkimming them off with a ſpoon when cold, and to drink, within an hour, a pint of this broth three times in the day—early in the morning—at noon—and in the evening; and to continue the uſe of this medicine for three, four, or more months; and, during this courſe, to live on ſuch things as leaſt counteract the operation of the medicine: to take for breakfaſt ſome plain broth, ſuch as has been deſcribed, with dry toaſted bread or biſcuit; or a diſh or two of tea or coffee in place of the broth: for dinner, to eat the lean part of plain boiled or roaſted meat, or a fowl, with their own gravy or juice for ſauce: and to eat only of vegetables which contain but little acid, ſuch as potatoes, &c. and to uſe for drink toaſt and water, or water with a very ſmall portion of ſpirit in it; and to abſtain from eating fruit and aceſcent vegetables, fat meat, butter, or oil; and from drinking wine, beer, cyder, punch, and in ſhort from taking any thing which is likely to counteract or deſtroy the effects of the ley."

With regard to the uſe of the ſoap-ley, our author obſerves, "that he has ſeen a number of people who have taken it, both for gravelliſh complaints and for the ſtone; that many of thoſe who had gravel were relieved, and ſome of them ſeemed to be cured; that ſome few of thoſe who had the confirmed ſtone, received conſiderable relief for a time from its uſe: but the complaints afterwards returned; nor can he ſay that one complete cure was made; though from the accounts given by the late Dr Whytt of Edinburgh, and others, it ſhould appear that this had ſometimes happened: that in many caſes of ſtone the ley occaſioned pain and irritation, and increaſed the violence of the ſymptoms ſo much, that the patients were obliged to lay it aſide; and that this happened moſt frequently where the bladder ſeemed to be already diſeaſed from the irritation of the ſtone: that at all times it is adviſable to lay aſide this medicine, at leaſt for a time, whenever it irritates and occaſions pain, or where there are appearances of its continued uſe having broken down the craſis of the blood."

19
Aerated vegetable alkali recommended.

Inſtead of the ſoap-ley, the following ſolution of vegetable alkali, fully ſaturated with fixed air, has been lately recommended as a powerful ſolvent of the ſtone. "Take two ounces of ſalt of tartar, and diſſolve it in two quarts of diſtilled water, and then ſaturate it fully with fixed air; and let the patient take eight ounces of it every eight hours." But though many caſes have been related in which this medicine is ſaid to have been ſerviceable, our author ſays he has ſeen only one gentleman who had taken it, and who had found conſiderable relief from it. Soap-ley has likewiſe been recommended as a ſolvent of bilious calculi, and has ſometimes been of ſervice; but this has probably ariſen more from its property of diſſolving thick and viſcid humours, and aſſiſting the action of the bile, than by acting on the calculi themſelves.

20
Medical virtues of the volatile alkali.

The volatile alkali has many of the virtues of the fixed, but affects animal ſubſtances, particularly in its cauſtic ſtate, leſs powerfully than they do. It gives a briſk and ſtrong ſtimulus to the nerves and fibres of living animals; and is therefore employed in diſeaſes where the pulſe is low and the circulation too languid; in low fevers, where the patient is in danger of ſinking; in apoplectic and lethargic diſorders of elderly people of phlegmatic habits, in paralytic caſes, fainting fits, &c. where a briſk and ſtimulating remedy is wanted. It is often uſed as a diaphoretic and ſudorific in caſes of rheumatiſm, in the end of fevers, catarrhs, and other diſeaſes, where a plentiful diaphoreſis or ſweat is required; and, according to our author, it is principally owing to this quality that the alkalis have obtained their reputation of being efficacious remedies againſt the bites of ſerpents and other venomous animals. It is equally efficacious againſt mineral acid poiſons with the fixed alkali.

21
Origin of alkaline ſalts.

It now remains only to give ſome account of the origin of the alkalis, or that proceſs by which they are naturally produced. This ſubject, however, is very much involved in obſcurity; nor has the origin of fixed alkalis, at leaſt, been inveſtigated with ſuch diligence and ſucceſs as that of the acids. Chemiſts have been divided in their opinions, whether alkaline ſalts be natural bodies, or formed by the force of fire, uniting the principles of which they conſiſt in the burning or diſtilling the ſubſtances from which they are got. It is generally ſuppoſed that they are formed by the force of fire intimately uniting an earth, an acid, and an inflammable matter together, ſo as to form an alkaline ſalt, which is ſuppoſed to be compoſed of theſe principles. In ſupport of this opinion, it has been alleged, 1. That the fixed vegetable alkali is produced by burning vegetables which contain the principles fit for forming theſe ſalts; though no veſtige of an alkali can be diſcovered in theſe vegetables in their natural ſtate. 2. That the eſſential ſalts of vegetables, which contain an acid and an earth, on being calcined in a crucible with charcoal, yield an alkaline ſalt. 3. That by alternately allowing the vegetable alkali to run per deliquium, and drying it again, it precipitates a quantity of earth every time it is diſſolved; ſo that the whole of the ſalt is at laſt reduced to this kind of earth, while the acid, phlogiſton, &c. have evaporated, or been deſtroyed by the repeated application of heat for drying the ſalt. 4. In like manner the volatile alkali is produced by diſtilling animal ſubſtances which contain the principles fit for producing it, though no marks of a volatile alkali could be diſcovered in theſe ſubſtances while they were freſh.

On the other hand, it has been aſſerted, that the alkaline ſalts obtained by burning vegetables, or diſtilling animal ſubſtances, exiſted originally in the materials from which they are procured; that they were generated in the plants by the proceſs of vegetation, and freed by the fire from the other principles which diſguiſed them. In ſupport of this opinion the following arguments are made uſe of by Meſſrs Weigleb, Roſenſtiel, Morveau, &c. 1. That they had not been able to procure an alkaline ſalt by mixing earths, oil, and acids together, and ſubjecting them to the moſt intenſe fire. 2. The cryſtals of tartar, which were formerly believed to be pure acid ſalts, have been found by late experiments to contain a vegetable alkali. 3. The vegetable alkaline ſalt, when purified, is always of the ſame nature, from whatever ſubſtance it is procured; and therefore muſt have been an original principle or body exiſting in the vegetables from which it is procured: for had it been produced by art, it would have varied, and we ſhould have had different ſpecies of it, according to the principles which the plants contained. And, 4. The neutral ſalts which have been found mixed with the aſhes of plants, as vitriolated tartar, nitre, and ſea-ſalt, are likewiſe ſtrong proofs of the original exiſtence of alkali in vegetables.

On this ſubject Dr Monro obſerves, that hitherto we have not ſufficient evidence to determine poſitively whether the vegetable alkali be produced by the force of fire, or if it exiſted originally in the ſubſtances from which it is prepared, though he is inclined to favour the former opinion. With regard to the volatile alkali, however, we have abundant evidence of its being produced from ſubſtances which could not poſſibly be ſuppoſed to contain it originally. Dr Stahl aſſures us, that if any dry fixed alkaline ſalt be well rubbed in a mortar with ſuch a quantity of oil of turpentine as is ſufficient to make it of the conſiſtence of a pulp, and digeſted for ſome weeks in a cucurbit or retort, we obtain a volatile alkali. Mr Geoffroy relates, that having placed a large retort in a ſand furnace, and adapted a tubulated receiver to it, afterwards heating the bottom of the retort red hot, he put into it, by means of a long tube riſing from the upper part of the neck, a powder compoſed of equal parts of nitre and charcoal, on which there came over into the receiver a liquor highly impregnated with volatile alkali. Cartheuſer, in the firſt volume of his Materia Medica, tells us, that if two parts of ſalt of tartar be mixed with one of ſulphur, and be afterwards diſtilled, they yield a volatile alkaline ſalt and ſpirit. Boerhaave and Macquer have both affirmed, that the vegetative proceſs itſelf produces a volatile alkali; and that the juices got by bruiſing muſtard-ſeed and other alkaleſcent vegetables, as they are called, contain a volatile alkali which effervesces with acids: but this is denied by Cartheuſer and Vogel, who affirm that they could diſcover no traces of volatile alkali in their juices by any experiments they made.

But whatever may be concluded from the experience of former chemiſts, the late diſcoveries of Dr Prieſtley and Mr Cavendiſh have deciſively ſhown, that the volatile alkali is by no means a ſimple element or natural principle, but a compound, and which may be artificially prepared. Dr Prieſtley informs us, that by the union of nitrous air with iron, a volatile alkali is generated; and Mr Cavendiſh, that by the action of the electric fluid, or pure elementary fire, upon phlogiſticated air, the nitrous acid is produced: the volatile alkali, therefore, muſt be ſuppoſed to conſiſt ultimately of phlogiſticated air united to a great quantity of elementary fire. In like manner, if we can ſuppoſe this ſubtile element to enter into the ſubſtance of any kind of earth in ſuch a manner as to exert its peculiar action when that ſubſtance is applied to any other, we may reaſonably conclude that the fixed alkalis alſo are not ſimple and permanent principles, but capable of artificial compoſition and decompoſition. It is certain that the action of alkaline ſalts is extremely ſimilar to that of fire; and as we know that this element is combined in a *latent* ſtate with fluids, there can be no abſurdity in ſuppoſing it capable of combining alſo with ſolids.

See Aerology, n° 149.

See Acid, n° 7.

ALKALI, or *Sal Kali*, in botany. See SALICORNIA.

ALKANET, in botany. See ANCHUSA.

ALKEKENGI, in botany, the trivial name of a ſpecies of phyſalis. See PHYSALIS.

ALKENNA, in botany. See LAWSONIA.

ALKERMES, in pharmacy, a compound cordial medicine made in the form of a confection, deriving its name from the kermes-berries uſed in its compoſition.

ALKORAN. See ALCORAN.

ALL-HALLOWS. See *All-Saints*.

ALL-Good. See CHENOPODIUM.

ALL-Heal. See HERACLEUM and STACHYS.

ALL-Saints, in the calendar, denotes a feſtival celebrated on the firſt of November, in commemoration of all the ſaints in general; which is otherwiſe called *All-Hallows*. The number of ſaints being ſo exceſſively multiplied, it was found too burdenſome to dedicate a feaſt-day to each. In reality, there are not days enough, ſcarce hours enough, in the year, for this purpoſe. Hence an expedient was had recourſe to, by commemorating ſuch in the lump as had not their own days. Boniface IV. in the ninth century, introduced the feaſt of *All Saints* in Italy, which was ſoon after adopted into the other churches.

All-Saints Bay, a ſpacious harbour near St Salvador in Brazil, in S. America, on the Atlantic Ocean. W. long. 40°. S. lat. 12°.

All-Souls, in the calendar, denotes a feaſt-day, held on the ſecond of November, in commemoration of all the faithful deceaſed.—The feaſt of All-Souls was firſt introduced in the eleventh century, by Odilon abbot of Cluny, who enjoined it on his own order; but it was not long before it came to be adopted by the neighbouring churches.

ALL-SPICE. See MYRTUS and CALYCANTHUS.

ALLA, or ALLAH, the name by which the profeſſors of Mahometaniſm call the Supreme Being.

The term *alla* is Arabic, derived from the verb *alah*, to adore. It is the ſame with the Hebrew *Eloah*, which ſignifies the *Adorable Being*.

ALLAMANDA, in botany; a genus of the monogynia order, belonging to the pentandria claſs of plants. The characters are: The *calyx* is a five leav'd perianthium: The *corolla* conſiſt of one funnel-ſhaped petal; the tube cylindric; the border ſemiquinquefid and ventricoſe; the diviſions expanding and obtuſe: The *ſtamina* have ſcarce any filaments; the antheræ are five, arrow-ſhap'd, converging, in the throat of the tube: The *piſtillum* has an oval germen, girt at the baſe with an annular margin; the ſtylus is filiform, the length of the tube; the ſtigma is headed, and contracted in the middle: The *pericarpium* is an orbicular, compreſs'd, briſtly capſule, containing one cell with two valves: The *ſeeds* are imbricated, orbicular, flat, with a membranaceous wing on the margin, and are very numerous. There is but one ſpecies, the cathartica, a native of Surinam.

ALLANTOIS, or ALLANTOIDES, a gut-ſhaped veſicle inveſting the fœtus of cows, goats, ſheep, &c. filled with an urinous liquor conveyed to it from the urachus.—(See *COMPARATIVE Anatomy*). Anatomiſts are not agreed whether the allantois has any exiſtence in the human ſpecies or not.

ALLATIUS (Leo), keeper of the Vatican library, a native of Scio, and a celebrated writer of the 17th century. He was of great ſervice to the gentlemen of Port Royal in the controverſy they had with M. Claude touching the belief of the Greeks with regard to the euchariſt. No Latin was ever more devoted to the ſee of Rome, or more inveterate againſt the Greek ſchiſmatics, than Allatius. He never engaged in matrimony, nor was he ever in orders; and Pope Alexander VII. having aſked him one day, why he did not enter into orders? he anſwered, “Becauſe, I would be free to marry.” The pope rejoined, “If ſo, why do you not marry?” “Becauſe,” replied Allatius, “I would be at liberty to take orders.” Thus, as Mr Bayle obſerves, he paſſed his whole life, wavering betwixt a pariſh and a wife; ſorry, perhaps, at his death, for having choſen neither of them; when if he had fixed upon one, he might have repented his choice for 30 or 40 years.—If we believe John Patricius, Allatius had a very extraordinary pen, with which, and no other, he wrote Greek for 40 years; and we need not be ſurpriſed, that, when he loſt it, he was ſo grieved, that he could ſcarce forbear crying. He publiſhed ſeveral manuſcripts, ſeveral tranſlations of Greek authors, and ſeveral pieces of his own compoſing. In his compoſitions he is thought to ſhow more erudition than judgment: he uſed alſo to make frequent digreſſions from one ſubject to another. He died at Rome in 1669, aged 83.

ALLAY. See ALLOY.

ALLEGATA, a word anciently ſubſcribed at the bottom of reſcripts and conſtitutions of the emperors; as *ſignata* or *teſtata*, was under other inſtruments.

ALLEGEAS, or ALLEGIAS, a ſtuff manufactured in the Eaſt-Indies. There are two ſorts of them; ſome are of cotton, and others of ſeveral kinds of herbs which are ſpun like flax and hemp. Their length and breadth are of eight ells, by five, ſix, or ſeven eighths; and of twelve ells, by three-fourths, or five-eighths.

ALLEGIANCE, in law, is the tie, or *ligamen*, which binds the ſubject to the government in return for that protection which the government affords the ſubject. The thing itſelf, or ſubſtantial part of it, is founded in reaſon and the nature of government; the name and the form are derived from ancient Gothic uſage. Under the feudal ſyſtem, every owner of lands held them in ſubjection to ſome ſuperior or lord, from whom or from whoſe anceſtors the tenant or vaſſal had received them: and there was a mutual truſt or confidence ſubſiſting between the lord and vaſſal, that the lord ſhould protect the vaſſal in the enjoyment of the territory he had granted him; and, on the other hand, that the vaſſal ſhould be faithful to the lord, and defend him againſt all his enemies. This obligation on the part of the vaſſal was called his *fidelitas* or fealty: and an oath of fealty was required by the feudal law to be taken by all tenants to their landlord, which is couched in almoſt the ſame terms as the ancient oath of allegiance; except that, in the uſual oath of fealty, there was frequently a ſaving or exception of the faith due to a ſuperior lord by name, under whom the landlord himſelf was perhaps only a tenant or vaſſal. But when the acknowledgment was made to the abſolute ſuperior himſelf, who was vaſſal to no man, it was no longer called the oath of fealty, but the oath of allegiance; and therein the tenant ſwore to bear faith to his ſovereign lord, in oppoſition to all men, without any ſaving or exception. Land held by this exalted ſpecies of fealty, was called *feudum ligium*, a liege fee; the vaſſals *homines ligii*, or liege men; and the ſovereign, their *dominus ligius*, or liege lord. And when ſovereign princes did homage to each other for lands held under their reſpective ſovereignties, a diſtinction was always made between *ſimple* homage, which was only an acknowledgment of tenure; and *liege* homage, which included the fealty before-mentioned, and the ſervices conſequent upon it. In Britain, it becoming a ſettled principle of tenure, that all lands in the kingdom are holden of the king as their ſovereign and lord paramount, no oath but that of fealty could ever be taken to inferior lords; and the oath of allegiance was neceſſarily confined to the perſon of the king alone. By an eaſy analogy, the term *allegiance* was ſoon brought to ſignify all other engagements which are due from ſubjects to their prince, as well as thoſe duties which were ſimply and merely territorial. And the oath of allegiance, as adminiſtered in England for upwards of 600 years, contained a promiſe “to be true and faithful to the king and his heirs, and truth and faith to bear of life and limb and terrene honour, and not to "know or hear of any ill or damage intended him, "without defending him therefrom." But, at the revolution, the terms of this oath being thought perhaps to favour too much the notion of non-reſiſtance, the preſent form was introduced by the convention parliament, which is more general and indeterminate than the former; the ſubject only promiſing "that he will "be faithful and bear *true* allegiance to the king," without mentioning "his heirs," or ſpecifying in the leaſt wherein that allegiance conſiſts. The oath of ſupremacy is principally calculated as a renunciation of the pope's pretended authority; and the oath of abjuration, introduced in the reign of King William, very amply ſupplies the looſe and general texture of the oath of allegiance; it recogniſing the right of his majeſty, derived under the act of ſettlement; engaging to ſupport him to the utmoſt of the juror's power; promiſing to diſcloſe all traiterous conſpiracies againſt him; and expreſsly renouncing any claim of the deſcendants of the late pretender, in as clear and explicit terms as the Engliſh language can furniſh. This oath muſt be taken by all perſons in any office, truſt, or employment; and may be tendered by two juſtices of the peace to any perſon whom they ſhall ſuſpect of diſaffection. And the oath of allegiance may be tendered to all perſons above the age of twelve years, whether natives, denizens, or aliens.

Blackſtone's Comment.

But, beſides theſe *expreſs* engagements, the law alſo holds that there is an *implied*, *original*, and *virtual* allegiance, owing from every ſubject to his ſovereign antecedently to any expreſs promiſe, and although the ſubject never ſwore any faith or allegiance in form. Thus Sir Edward Coke very juſtly obſerves, that "all ſubjects are equally bounden to their allegiance as if they had taken the oath; becauſe it is written by the finger of the law in their hearts, and the taking of the corporal oath is but an outward declaration of the ſame."

Allegiance, both expreſs and implied, is however diſtinguiſhed by the law into two ſorts or ſpecies, the one *natural*, the other *local*; the former being alſo perpetual, the latter temporary.

Natural allegiance is ſuch as is due from all men born within the king's dominions immediately upon their birth. For, immediately after their birth, they are under the king's protection; at a time too, when (during their infancy) they are incapable of protecting themſelves. Natural allegiance is, therefore, a debt of gratitude which cannot be forfeited, cancelled, or altered by any change of time, place, or circumſtance, nor by any thing but the united concurrence of the legiſlature. A Briton who removes to France, or to China, owes the ſame allegiance to the king of Britain there as at home, and twenty years hence as well as now. For it is a principle of univerſal law, That the natural-born ſubject of one prince cannot by any act of his own, no, not by ſwearing allegiance to another, put off or diſcharge his natural allegiance to the former: for this natural allegiance was intrinſic, and primitive, and antecedent to the other; and cannot be diveſted without the concurrent act of that prince to whom it was firſt due.

Local allegiance is ſuch as is due from an alien, or ſtranger born, for ſo long a time as he continues within the king's dominion and protection; and it ceaſes the inſtant ſuch ſtranger transfers himſelf from one kingdom to another. Natural allegiance is therefore *perpetual*, and local *temporary* only; and that for this reaſon, evidently founded upon the nature of government, That allegiance is a debt due from the ſubject, upon an implied contract with the prince; that ſo long as the one affords protection, ſo long the other will demean himſelf faithfully.

The *oath* of allegiance, or rather the *allegiance* itſelf is held to be applicable, not only to the political capacity of the king, or regal office, but to his natural perſon and blood-royal: and for the miſapplication of their allegiance, viz. to the regal capacity or crown, excluſive of the perſon of the king, were the Spencers baniſhed in the reign of Edward II. And from hence aroſe that principle of perſonal attachment and affectionate loyalty, which induced Engliſhmen in former times (and, if occaſion required, would doubtleſs induce their ſons) to hazard all that was dear to them, life, fortune and family, in defence and ſupport of their liege lord and ſovereign.

It is to be obſerved, however, in explanation of this allegiance, That it does not preclude reſiſtance to the king, when his miſconduct or weakneſs is ſuch as to make reſiſtance beneficial to the community. It ſeems fairly preſumable, that the convention parliament, which introduced the oath of allegiance in its preſent form, did not intend to exclude all reſiſtance; ſince the very authority by which the members ſat together, was itſelf the effect of a ſucceſsful oppoſition to an acknowledged ſovereign.

Paley's Moral and Political Philoſophy. Philad. Ed. p. 142.

Again: The allegiance above deſcribed can only be underſtood to ſignify obedience to lawful commands. If, therefore, the king ſhould iſſue a proclamation, levying money or impoſing any ſervice or reſtraint upon the ſubject, beyond what the law authoriſed, there would exiſt no ſort of obligation to obey ſuch a proclamation, in conſequence of having taken the oath of allegiance.

Neither can allegiance be ſuppoſed to extend to the king after he is actually and abſolutely depoſed, driven into exile, or otherwiſe rendered incapable of exerciſing the regal office. The promiſe of allegiance implies, that the perſon to whom the promiſe is made continues king; that is, continues to exerciſe the power, and afford the protection, which belong to the office of king: for it is the poſſeſſion of theſe which makes ſuch a particular perſon the object of the oath.

ALLEGORY, in compoſition, conſiſts in chooſing a ſecondary ſubject, having all its properties and circumſtances reſembling thoſe of the principal ſubject, and deſcribing the former in ſuch a manner as to repreſent the latter. The principal ſubject is thus kept out of view and we are left to diſcover it by reflection. In other words, an allegory is, in every reſpect, ſimilar to an hieroglyphical painting, excepting only that words are uſed inſtead of colours. Their effects are preciſely the ſame; An hieroglyphic raiſes two images in the mind; one ſeen, that repreſents one that is not ſeen: An allegory does the ſame; the repreſentative ſubject is deſcribed, and the reſemblance leads us to apply the deſcription to the ſubject repreſented.

There cannot be a finer or more correct allegory than the following, in which a vineyard is made to repreſent God's own people the Jews:

“ Thou haſt brought a vine out of Egypt; thou haſt caſt out the heathen, and planted it. Thou didſt cauſe it to take deep root, and it filled the land. The hills were covered with its ſhadow, and the boughs thereof were like the goodly cedars. Why haſt thou then broken down her hedges, ſo that all that paſs do pluck her? The boar out of the wood doth waſte it, and the wild beaſt doth devour it. Return, we beſeech thee, O God of hoſts: look down from heaven, and behold, and viſit this vine and the vineyard thy right-hand hath planted, and the branch thou madeſt ſtrong for thyſelf.” Pſal. lxxx.

Nothing gives greater pleaſure than an allegory, when the repreſentative ſubject bears a ſtrong analogy, in all its circumſtances, to that which is repreſented. But moſt writers are unlucky in their choice, the analogy being generally ſo faint and obſcure, as rather to puzzle than to pleaſe. Allegories, as well as metaphors and ſimilies, are unnatural in expreſſing any ſevere paſſion which totally occupies the mind. For this reaſon, the following ſpeech of Macbeth is juſtly condemned by the learned author of the Elements of Criticiſm:

Methought I heard a voice cry, Sleep no more!
Macbeth doth murder Sleep; the innocent ſleep;
Sleep that knits up the ravell'd ſleeve of Care,
The birth of each day's life, ſore Labour's bath,
Balm of hurt minds, great Nature's ſecond courſe,
Chief nouriſher in life's feaſt. Act. ii. Sc. 3.

But ſee this ſubject more fully treated under the article METAPHOR *and Allegory*.

ALLEGRI (Antonio), called *Corregio* from the place of his birth, an eminent hiſtorical painter, was born in the year 1494. Being deſcended of poor parents and educated in an obſcure village, he enjoyed none of thoſe advantages which contributed to form the other great painters of that illuſtrious age. He ſaw none of the ſtatues of ancient Greece or Rome; nor any of the works of the eſtabliſhed ſchools of Rome and Venice. But Nature was his guide; and Corregio was one of her favourite pupils. To expreſs the facility with which he painted, he uſed to ſay that he always had his thoughts ready at the end of his pencil.

The agreeable ſmile, and the profuſion of graces which he gave to his madonas, ſaints, and children, have been taxed with being ſometimes unnatural; but ſtill they are amiable and ſeducing: An eaſy and flowing pencil, an union and harmony of colours, and a perfect intelligence of light and ſhade, give an aſtoniſhing relief to all his pictures, and have been the admiration both of his cotemporaries and his ſucceſſors. Annibal Caracci, who flouriſhed 50 years after him, ſtudied and adopted his manner in preference to that of any other maſter. In a letter to his couſin Louis, he expreſſes with great warmth the impreſſion which was made on him by the firſt ſight of Corregio's paintings: “ Every thing which I ſee here (ſays he) aſtoniſhes me; particularly the colouring and the beauty of the children. They live—they breathe—they ſmile with ſo much grace and ſo much reality, that it is impoſſible to refrain from ſmiling and partaking of their enjoyment. My heart is ready to break with grief when I think on the unhappy fate of poor Corregio—that ſo wonderful a man (if he ought not rather to be called an angel) ſhould finiſh his days ſo miſerably, in a country where his talents were never known!”——

From want of curioſity or of reſolution, or from want of patronage, Corregio never viſited Rome, but remained his whole life at Parma, where the art of painting was little eſteemed, and of conſequence poorly rewarded. This concurrence of unfavourable circumſtances occaſioned at laſt his premature death at the age of 40. He was employed to paint the cupola of the cathedral at Parma, the ſubject of which is an aſſumption of the Virgin; and having executed it in a manner that has long been the admiration of every perſon of good taſte, for the grandeur of deſign, and eſpecially for the boldneſs of the fore-ſhortenings (an art which he firſt and at once brought to the utmoſt perfection), he went to receive his payment. The canons of the church, either through ignorance or baſeneſs, found fault with his work; and although the price originally agreed upon had been very moderate, they alledged that it was far above the merit of the artiſt, and forced him to accept of the paultry ſum of 200 livres; which, to add to the indignity, they paid him in copper money. To carry home this unworthy load to his indigent wife and children, poor Corregio had to travel ſix or eight miles from Parma. The weight of his burden, the heat of the weather, and his chagrin at this villanous treatment, immediately threw him into a pleuriſy, which in three days put an end to his life and his misfortunes.

For the preſervation of this magnificent work the world is indebted to Titian. As he paſſed through Parma, in the *ſuite* of Charles V. he ran inſtantly to ſee the *chef d'œuvre* of Corregio. While he was attentively viewing it, one of the principal canons of the church told him that ſuch a groteſque performance did not merit his notice, and that they intended ſoon to have the whole defaced. “ Have a care of what you do (replied the other), if I were not Titian, I would certainly wiſh to be Corregio.”

Corregio's exclamation upon viewing a picture by Raphael is well known. Having long been accuſtomed to hear the moſt unbounded applauſe beſtowed on the works of that divine painter, he by degrees became leſs deſirous than afraid of ſeeing any of them. One, however, he at laſt had occaſion to ſee. He examined it attentively for ſome minutes in profound ſilence; and then with an air of ſatisfaction exclaimed, *I am ſtill a painter*. Julio Romano, on ſeeing ſome of Corregio's pictures at Parma, declared they were ſuperior to any thing in painting he had yet beheld. One of theſe no doubt would be the famous Virgin and Child, with Mary Magdalene and St Jerom: But whether our readers are to depend upon his opinion or upon that of Lady Millar, who in her *Letters from Italy* gives a very unfavourable account of it, we ſhall not preſume to determine. This lady, however, ſpeaks in a very different ſtile of the no leſs famous *Notte* or Night of Corregio, of which ſhe ſaw only a copy in the Duke's palace at Modena, the original having been ſold for a great ſum of money to the king of Poland. “ It ſurpriſes me very much (ſays ſhe), to ſee how different the characters are in this picture from that which I already have deſcribed to you. The ſubject is a Nativity; and the extraordinary beauty of this picture proceeds from the *clair obſcure*:

obſcure: there are two different lights introduced, by means of which the perſonages are viſible; namely, the light proceeding from the body of the child, and the moon-light. Theſe two are preſerved diſtinct, and produce a moſt wonderful effect. The child's body is ſo luminous, that the ſuperficies is nearly tranſparent, and the rays of light emitted by it are verified in the effect they produce upon the ſurrounding objects. They are not rays diſtinct and ſeparate, like thoſe round the face of a ſun that indicates an inſurance-office; nor linear, like thoſe proceeding from the man in the almanack; but of a dazzling brightneſs: by their light you ſee clearly the face, neck, and hands, of the Virgin (the reſt of the perſon being in ſtrong ſhadow), the faces of the *paſtori* who crowd round the child, and particularly one woman, who holds her hand before her face, leſt her eyes ſhould be ſo dazzled as to prevent her from beholding the Infant. This is a beautiful natural action, and is moſt ingeniouſly introduced. The ſtraw on which the child is laid appears gilt, from the light of his body ſhining on it. The moon lights up the back-ground of the picture, which repreſents a landſcape. Every object is diſtinct, as in a bright moon-light night; and there cannot be two lights in nature more different than thoſe which appear in the ſame picture. The virgin and the child are of the moſt perfect beauty. There is a great variety of character in the different perſons preſent, yet that uniformity common to all herdſmen and peaſants. In ſhort, this copy is ſo admirable, that I was quite ſorry to be obliged to loſe ſight of it ſo ſoon; but I never ſhall forget it. The duke of Modena, for whom Corregio did the original picture, gave him only 600 livres of France for it; a great ſum in thoſe days: but at preſent, what ought it to coſt?" This great painter's death happened in 1534.

ALLEGRO, in muſic, an Italian word, denoting that the part is to be played in a ſprightly, briſk, lively, and gay manner.

Piu Allegro, ſignifies, that the part it is joined to ſhould be ſung or played quicker; as

Poco piu Allegro intimates, that the part to which it refers ought to be played or ſung only a little more briſkly than allegro alone requires.

ALLEIN (Joſeph), the ſon of Tobias Allein, was born in the Devizes, in Wiltſhire, in 1633, and educated at Oxford. In 1655, he became aſſiſtant to Mr Newton, in Taunton-Magdalen, in Somerſetſhire; but was deprived for non-conformity. He died in 1668, aged 35. He was a man of great learning, and greater charity; preſerving, though a nonconformiſt and a ſevere ſufferer on that account, great reſpect for the church, and loyalty to his ſovereign. He wrote ſeveral books of piety, which are highly eſteemed; but his *Alarm to unconverted ſinners* is more famous than the reſt. There have been many editions of this little pious work, the ſale of which has been very great; of the edition 1672, there were 20,000 ſold; of that of 1675, with this title, *A ſure guide to heaven*, 50,000. There was alſo a large impreſſion of it with its firſt title, in 1720.

ALLELUIAH, or HALLELUIAH, a word ſignifying, *praiſe the Lord*, to be met with either at the beginning or end of ſome pſalms: ſuch as pſalm cxlv. and thoſe that follow, to the end. Alleluiah was ſung upon ſolemn days of rejoicings, Tobit xiii. 12. St John in the Revelations (xix. 1, 3, 4, 6.) ſays, that he "heard a great voice of much people in heaven, who ſaid, Alleluiah; and the four and twenty elders, and the four beaſts, fell down and worſhipped God that ſat on the throne, ſaying *Alleluiah*." This hymn of joy and praiſe was transferred from the ſynagogue to the church. St Jerom tells us, that at the funeral of Fabiola ſeveral pſalms were ſung with loud alleluiahs; and that the monks of Paleſtine were awakened, at their midnight watchings, with the ſinging of alleluiahs. So much energy has been obſerved in this term, that the ancient church thought proper to preſerve it, without tranſlating it either into Greek or Latin, for fear of impairing the genius and ſoftneſs of it. The fourth council of Toledo has prohibited the uſe of it in times of Lent, or other days of faſting, and in the ceremonies of mourning: and, according to the preſent practice of the Romiſh church, this word is never repeated in Lent, nor in the obſequies of the dead; notwithſtanding which, it is uſed in the maſs for the dead, according to the moſarabic ritual, at the introit, when they ſing, *Tu es portio mea, Domine, Alleluia, in terra viventium, Alleluia, Alleluia.* The ſinging alleluiah was oftentimes an invitatory or call to each other to praiſe the Lord.

ALLEMAND, a ſort of grave ſolemn muſic, with good meaſure, and a ſlow movement.—It is alſo a briſk kind of dance, very common in Germany and Switzerland.

ALLEMANNIC, in a general ſenſe, denotes any thing belonging to the ancient Germans. Thus, we meet with Allemannic hiſtory, Allemannic language, Allemannic law, &c.

ALLEN (John) archbiſhop of Dublin in the reign of king Henry VIII. was educated in the univerſity of Oxford; from whence removing to Cambridge, he there took the degree of bachelor of laws. He was ſent by Dr Warham, archbiſhop of Canterbury, to the pope, about certain matters relating to the church. He continued at Rome nine years, and was created doctor of laws; either there or in ſome other univerſity of Italy. After his return, he was appointed chaplain to Cardinal Wolſey, and was commiſſary or judge of his court as legate *à latere*; in the execution of which office he was ſuſpected of great diſhoneſty, and even perjury. He aſſiſted the cardinal in viſiting, and afterwards ſuppreſſing, 40 of the ſmaller monaſteries, for the erection of his college at Oxford and that at Ipſwich. The cardinal procured for him the living of Dalby in Leiceſterſhire, though it belonged to the maſter and brethren of the hoſpital of Burton Lazars. About the latter end of the year 1525 he was incorporated doctor of laws in the univerſity of Oxford. On the 13th of March 1528 he was conſecrated archbiſhop of Dublin, in the room of Dr Hugh Inge deceaſed; and about the ſame time was made chancellor of Ireland. He wrote, 1. *Epiſtolo de Pallii ſignificatione activa et paſſiva*; penned by him at the time when he received the archiepiſcopal pall. 2. *De conſuetudinibus ac ſtatutis in tuitoriis cauſis obſervandis.* He wrote alſo ſeveral other pieces relating to the church. His death, which happened in July 1534, was very tragical: for being taken in a time of rebellion by Thomas Fitzgerald, eldeſt ſon to the earl of Kildare, he was by his command moſt cruelly murdered, being brained like an ox, at Tartaine in Ireland, in the 58th year of his age. The place where the murder was committed was afterwards hedged in, overgrown, and unfrequented, in deteſtation of the fact.

Allen (Thomas), a famous mathematician of the 16th century, born at Utoxeter in Staffordſhire the 21ſt of December 1542. He was admitted ſcholar of Trinity-college Oxford the 4th of June 1561; and in 1567 took his degree of maſter of arts. In 1570 he quitted his college and fellowſhip and retired to Glouceſter-hall; where he ſtudied very cloſely, and became famous for his knowledge in antiquity, philoſophy, and mathematics. Having received an invitation from Henry earl of Northumberland, a great friend and patron of the mathematicians, he ſpent ſome time at the earl's houſe, where he became acquainted with thoſe celebrated mathematicians Thomas Harriot, John Dee, Walter Warner, and Nathaniel Torporley. Robert earl of Leiceſter had a particular eſteem for Mr Allen, and would have conferred a biſhopric upon him, but his love of ſolitude and retirement made him decline the offer. His great ſkill in the mathematics made the ignorant and vulgar look upon him as a magician or conjurer: the author of a book intitled *Leiceſter's Commonwealth*, has accordingly accuſed him with uſing the art of figuring, to procure the earl of Leiceſter's unlawful deſigns, and endeavouring by the black art to bring about a match betwixt him and Queen Elizabeth. But without pretending to point out the abſurdity of the charge, it is certain that the earl placed ſuch confidence in Allen, that nothing material in the ſtate was tranſacted without his knowledge; and the earl had conſtant information, by letter, from Mr Allen, of what paſſed in the univerſity. Mr Allen was very curious and indefatigable in collecting ſcattered manuſcripts relating to hiſtory, antiquity, aſtronomy, philoſophy, and mathematics: theſe collections have been quoted by ſeveral learned authors, &c. and mentioned to have been in the Bibliotheca Alleniana. He publiſhed in Latin the ſecond and third books of Claudius Ptolemy of Peluſium, *Concerning the Judgment of the Stars*, or, as it is commonly called, of the *Quadripartite Conſtruction*, with an expoſition. He wrote alſo notes on many of Lilly's books, and ſome on John Bale's work *De Scriptoribus M. Britanniæ*. Having lived to a great age, he died at Glouceſter-hall on the 30th of September 1632.

ALLENDORF, a ſmall town in the circle of the Upper Rhine, and in the landgraviate of Heſſe-Caſſel, remarkable for its ſalt-works and three ſtone-bridges. It is ſeated on the river Weſer, 15 miles eaſt of Caſſel; E. Long. 10. 5. N. Lat. 51. 26.

ALLER, a river which runs through the duchy of Lunenburg, and falls into the Weſer a little below Verden.

Aller, *good*, in our ancient writers. The word *aller* ſerves to make the expreſſion of ſuperlative ſignification. So, *aller-good* is the greateſt good. Sometimes it is written *alder*.

ALLERION, or Alerion, in heraldry, a ſort of eagle without beak or feet, having nothing perfect but the wings. They differ from martlets by having their wings expanded, whereas thoſe of the martlet are cloſe; and denote imperialiſts vanquiſhed and diſarmed; for which reaſon they are more common in French than in German coats of arms.

ALLESTRY (Richard, D. D.) an eminent divine, born at Uppington in Shropſhire in March 1619, was educated in the grammar-ſchool at Coventry, and afterwards at Chriſt-church in Oxford. His parts, which were extraordinary, were improved by a no leſs extraordinary induſtry. He took up arms for king Charles I. and was ſometimes ſeen with his muſket in one hand and his book in the other. He was very active in the ſervice of king Charles II. before his reſtoration, and was employed by the royaliſts in tranſacting buſineſs with that prince during his exile; but was at laſt ſeized at Dover by a party of ſoldiers, and committed priſoner to Lambeth-houſe, where he was confined ſix or eight weeks: but ſoon after the reſtoration he was made canon of Chriſt-church, created doctor of divinity, and appointed chaplain in ordinary to the king, and regius profeſſor of divinity. In 1665 he was appointed provoſt of Eton college, where he raiſed the ſchool, which he found in a low condition, to an uncommon pitch of reputation. The weſt ſide of the outward quadrangle of that college was built from the ground at his expence. The excellent Dr Hammond, who was his intimate friend, left him his valuable library, which he himſelf afterwards bequeathed to his ſucceſſors in the divinity-chair. He was eminent for his piety, benevolence, and integrity; for the ſincerity of his friendſhip, and his diſintereſted temper. He wrote ſeveral books; and a collection of his ſermons were printed after his deceaſe by Dr Fell biſhop of Oxford. He died Auguſt 28. 1680.

Allestry (Jacob), an Engliſh poet of the laſt century. He was the ſon of James Alleſtry, a bookſeller of London, who was ruined by the great fire in 1666. Jacob was educated at Weſtminſter ſchool, entered at Chriſt-church Oxford in the act-term 1671 at the age of 18, and was elected ſtudent in 1672. He took the degree in arts; was muſic-reader in 1679, and terræ filius in 1681; both which offices he executed with great applauſe, being eſteemed a good philologiſt and poet. He had a chief hand in the verſes and paſtorals ſpoken in the theatre at Oxford May 21. 1681, by Mr William Savile ſecond ſon of the marquis of Halifax, and George Cholmondely ſecond ſon of Robert viſcount Kells (both of Chriſt-church), before James duke of York, his ducheſs, and the lady Anne; which verſes and paſtorals were afterwards printed in the "Examen Poeticum." He died October 15. 1686, and was buried in St Thomas's church-yard.

ALLEVEURE, a ſmall braſs Swediſh coin, worth about ½d. Engliſh money.

ALLEVIATION, denotes the making a thing lighter, and eaſier to bear or endure. It ſtands oppoſed to *aggravation*.

ALLEY (William), biſhop of Exeter in the reign of queen Elizabeth, was born at Great Wycomb in Buckinghamſhire. From Eton ſchool, in the year 1528, he removed to king's college Cambridge, where he took the degree of bachelor of arts. He alſo ſtudied ſome time at Oxford; afterwards he married, was preſented to a living, and became a zealous reformer. Upon queen Mary's acceſſion he left his cure and retired into the north of England; where he maintained his wife and himſelf by teaching a ſchool, and practiſing phyſic. Queen Elizabeth aſcending the throne, he went to London, where he acquired great reputation by reading the divinity-lecture at St Paul's, and in July 1560 was conſecrated biſhop of Exeter. He was created doctor of divinity at Oxford in November 1561. He died on the 15th of April 1570, and was buried at Exeter in the cathedral. He wrote 1. *The poor man's library*, 2 vol. fol. Lond. 1571. Theſe volumes contain twelve lectures on the firſt epiſtle of St Peter, read at St Paul's. 2. *A Hebrew Grammar.* Whether it was ever publiſhed is uncertain. He tranſlated the Pentateuch, in the verſion of the Bible which was undertaken by queen Elizabeth's command.

ALLEY, in gardening, a ſtraight parallel walk, bounded on both ſides with trees, ſhrubs, &c. and uſually covered with gravel or turf.

ALLEY, among builders, denotes a narrow paſſage leading from one place to another.

ALLEY, in perſpective, that which, in order to have a greater appearance of length, is made wider at the entrance than at the termination.

ALLEY, in the new huſbandry, implies the vacant ſpace between the outermoſt row of corn on one bed and the neareſt row to it on the next parallel bed; and it is uſually about four feet in breadth, excluſive of the partitions between the rows of corn in the beds. The firſt hoeing of wheat is performed in the beginning of winter, and the earth is ploughed away from the rows into the intervals, which forms ſmall ridges in the middle between the double rows. The ſecond hoeing is in the ſpring, which turns it back to the rows, leaving a furrow in the middle of the alley. The third hoeing is from the rows, after the wheat has bloſſomed; this turns the earth into the intervals, forming ſmall ridges there, as at the firſt hoeing. The fourth hoeing returns the earth to the ridges, which is performed a month or more after the third hoeing. This commonly finiſhes the horſe-hoeings, if the land is in good heart; otherwiſe one or two more hoeings are neceſſary.

ALLEYN (Edward), a celebrated Engliſh actor in the reigns of queen Elizabeth and king James, and founder of the college at Dulwich in Surry, was born at London, in the pariſh of St Botolph, Sept. 1. 1566, as appears from a memorandum of his own writing. Dr Fuller ſays, that he was bred a ſtage-player; and that his father would have given him a liberal education, but that he was not turned for a ſerious courſe of life. He was, however, a youth of an excellent capacity, a cheerful temper, a tenacious memory, a ſweet elocution, and in his perſon of a ſtately port and aſpect; all which advantages might well induce a young man to take to the theatrical profeſſion. By ſeveral authorities we find he muſt have been on the ſtage ſome time before 1592; for at this time he was in high favour with the town, and greatly applauded by the beſt judges, particularly by Ben Johnſon.

Haywood, in his prologue to Marloe's Jew of Malta, calls him Proteus for ſhapes, and Roſcius for a tongue. He uſually played the capital parts, and was one of the original actors in Shakeſpeare's plays; in ſome of Ben Johnſon's he was alſo a principal performer: but what characters he perſonated in either of theſe poets, it is difficult now to determine. This is owing to the inaccuracy of their editors, who did not print the names of the players oppoſite to the characters they performed, as the modern cuſtom is; but gave one general liſt of actors to the whole ſet of plays, as in the old folio edition of Shakeſpeare; or divided one from the other, ſetting the dramatis perſonæ before the plays, and the catalogue of performers after them, as in Johnſon's.

It may appear ſurpriſing how one of Mr Alleyn's profeſſion ſhould be enabled to erect ſuch an edifice as Dulwich College, and liberally endow it for the maintenance of ſo many perſons. But it muſt be obſerved that he had ſome paternal fortune, which, though ſmall, might lay a foundation for his future affluence; and it is to be preſumed, that the profits he received from acting, to one of his provident and managing diſpoſition, and one who by his excellence in playing drew after him ſuch crowds of ſpectators, muſt have conſiderably improved his fortune: beſides, he was not only an actor, but maſter of a playhouſe, built at his own expence, by which he is ſaid to have amaſſed conſiderable wealth. He was alſo keeper of the king's wild beaſts, or maſter of the royal bear-garden, which was frequented by vaſt crowds of ſpectators; and the profits ariſing from theſe ſports are ſaid to have amounted to 500l. per annum. He was thrice married; and the portions of his two firſt wives, they leaving him no iſſue to inherit, might probably contribute to this benefaction. Such kind of donations have been frequently thonght to proceed more from vanity and oſtentation than real piety; but this of Mr Alleyn has been aſcribed to a very ſingular cauſe, for the devil has been ſaid to be the firſt promoter of it. Mr Aubrey mentions a tradition, "that Mr Alleyn playing a demon with ſix others, in one of Shakeſpeare's plays, was, in the midſt of the play, ſurpriſed by an apparition of the devil; which ſo worked on his fancy, that he made a vow, which he performed by building Dulwich college." He began the foundation of this college, under the direction of Inigo Jones, in 1614; and the buildings, gardens, &c. were finiſhed in 1617, in which he is ſaid to have expended about 10,000l. After the college was built, he met with ſome difficulty in obtaining a charter for ſettling his lands in mortmain: for he propoſed to endow it with 800l. per annum, for the maintenance of one maſter, one warden, and four fellows, three whereof were to be clergymen, and the fourth a ſkilful organiſt; alſo ſix poor men and as many women, beſides twelve poor boys to be educated till the age of fourteen or ſixteen, and then put out to ſome trade or calling. The obſtruction he met with aroſe from the lord chancellor Bacon, who wiſhed king James to ſettle part of thoſe lands for the ſupport of two academical lectures; and he wrote a letter to the Marquis of Buckingham, dated Auguſt 18. 1618, intreating him to uſe his intereſt with his Majeſty for that purpoſe. Mr Alleyn's ſolicitation was however at laſt complied with, and he obtained the royal licence, giving him full power to lay his foundation, by his Majeſty's letter-patent, bearing date the 21ſt of June, 1619; by virtue whereof he did, in the chapel of the ſaid new hoſpital at Dulwich, called "The College of God's Gift," on the 13th of September following, publicly read and publiſhed a quadripartite writing in parchment, whereby he created and eſtabliſhed the ſaid college; he then ſubſcribed it with his name, and fixed his ſeal to ſeveral parts thereof, in preſence of ſeveral honourable perſons, and ordered copies of the writings to four different pariſhes. He was himſelf the firſt maſter of his college; ſo that to make uſe of the words of Mr Haywood, one of his contemporaries, "He was ſo mingled with humility and charity, that he became his own penſioner, humbly ſubmitting himſelf to that proportion of diet and clothes which he had beſtowed on others." We have no reaſon to think he ever repented of this diſtribution of his ſubſtance; but on the contrary, that he was entirely ſatisfied, as appears from the following memorial in his own writing, found amongſt his papers: "May 26, 1620—My wife and I acknowledged the fine at the common pleas bar, of all our lands to the college: bleſſed be God that he has given us life to do it." His wife died in the year 1623; and about two years afterwards he married Conſtance Kinchtoe, who ſurvived him, and received remarkable proofs of his affection, if at leaſt we may judge of it by his will, wherein he left her conſiderably. He died Nov. 25. 1626, in the 61ſt year of his age, and was buried in the chapel of his new college, where there is a tomb-ſtone over his grave, with an inſcription. His original Diary is alſo there preſerved.

The ſubjoined anecdote is entertaining in itſelf, and ſhows the high eſteem in which Mr Alleyn was held as an actor: 'Edward Alleyn, the Garrick of Shakeſpeare's time, had been on the moſt friendly footing with our poet, as well as Ben Johnſon. They uſed frequently to ſpend their evenings together at the ſign of the Globe, ſomewhere near Black Friars, where the playhouſe then was. The world need not be told, that the convivial hours of ſuch a triumvirate muſt be pleaſing as well as profitable, and may truly be ſaid to be ſuch pleaſures as might bear the reflections of the morning. In conſequence of one of theſe meetings, the following letter was written by G. Peel, a Fellow of Chriſt-church college, Oxford, and a dramatic poet, who belonged to the Club, to one Marle, an intimate of his:

"Friend Marle,

"I muſt deſyr that my ſyſter hyr watch, and the cookerie book you promyſed, may be ſente bye the man.——I never longed for thy company more than laſt night: we were all very merry at the Globe, when Ned Alleyn did not ſcruple to affyrme pleaſauntely to thy Friende Will, that he had ſtolen his ſpeech about the Qualityes of an actor's excellencye in Hamlet hys Tragedye, from converſations manyfold whych had paſſed betweene them, and opinyons given by Alleyn touchinge the ſubjecte.——Shakeſpeare did not take this talke in good ſorte; but Johnſon put an end to the ſtrife with wittylye remarkinge, *This affaire needeth no contentione; you ſtole it from Ned, no doubte; do not marvel: Have you not ſeen him act tymes out of number?*—Believe me moſt ſyncerilie, yours, *G. Peele.*"

ALLIA, a river of Italy, which running down a very ſteep channel from the mountains of Cruſtuminum, mixes with the Tiber at 40 miles from Rome; famous for the great ſlaughter of the Romans by the Gauls, under Brennus; hence *Allienſis dies*, an unlucky day, (Virgil, Ovid, Lucan.) Our anceſtors, ſays Cicero, deemed the day of the fight of *Allia* more fatal than that of taking the city.

ALLIANCE, in the civil and canon law, the relation contracted between two perſons or two families by marriage.

ALLIANCE is alſo uſed for a treaty entered into by ſovereign princes and ſtates, for their mutual ſafety and defence.—In this ſenſe, alliances may be diſtinguiſhed into ſuch as are offenſive, whereby the contracting parties oblige themſelves jointly to attack ſome other power; and into defenſive ones, whereby they bind themſelves to ſtand by and defend each other, in caſe they are attacked by others.—Alliance, with the ancient Romans, though a ſort of ſervitude, was much coveted. Ariarathes, we are told by Polybius, offered a ſacrifice to the gods by way of thankſgiving for having obtained this alliance. The reaſon was, that thenceforwards people were ſure not to receive any injuries except from them.—There were different ſorts of allies; ſome only united to them by a participation of the privileges of Romans, as the Latini and Hernici; others by their very foundation, as the colonies; others by the benefactions they received from them, as Maſſiniſſa, Eumenes, and Attalus, who owed their kingdoms to Rome; others by free treaties, which laſt by a long alliance became ſubjects, as the kings of Bithynia, Cappadocia, Egypt, and moſt of the cities of Greece: laſtly, others by compulſive treaties, and the law of ſubjection, as Philip and Antiochus. For they never granted peace to an enemy, without making an alliance with him; that is, they never ſubdued any people without uſing it as a means of ſubduing others.

The forms or ceremonies of alliances have been various in different ages and countries. At preſent, ſigning and ſwearing, ſometimes at the altar, are the chief: anciently eating and drinking together, chiefly offering ſacrifices together, were the cuſtomary rite of ratifying an alliance. Among the Jews and Chaldeans, heifers or calves; among the Greeks, bulls or goats; and among the Romans, hogs were ſacrificed on this occaſion. Among the ancient Arabs, alliances were confirmed by drawing blood out of the palms of the hands of the two contracting princes with a ſharp ſtone, dipping herein a piece of their garments, and therewith ſmearing ſeven ſtones, at the ſame time invoking the gods Vrotalt and Alilat, *i. e.* according to Herodotus, Bacchus and Urania. Among the people of Cholchis, the confirmation of alliances is ſaid to be effected by one of the princes offering his wife's breaſts to the other to ſuck, which he was obliged to do till there iſſued blood.

ALLIANCE, in a figurative ſenſe, is applied to any kind of union or connection; thus we ſay, there is an alliance between the church and ſtate.

ALLIGATI, in Roman antiquity, the baſeſt kind of ſlaves, who were uſually kept fettered. The Romans had three degrees, or orders, of ſlaves or ſervants; the firſt employed in the management of their eſtates; the ſecond in the menial or lower functions of the family; the third called *alligati*, above mentioned.

ALLIGATION, the name of a method of ſolving all queſtions that relate to the mixture of one ingredient with another. Though writers on arithmetic generally make alligation a branch of that ſcience; yet, as it is plainly nothing more than an application of the common properties of numbers, in order to ſolve a few queſtions that occur in particular branches of buſineſs, we chooſe rather to keep it diſtinct from the ſcience of arithmetic.

Alligation is generally divided into *medial* or *alternate*.

Alligation Medial, from the rates and quantities of the ſimples given, diſcovers the rate of the mixture.

Rule. As the total quantity of the ſimples,
To their price or value ;
So any quantity of the mixture,
To the rate.

Examp. A grocer mixeth 30 ℔. of currants, at 4d. per ℔. with 10 ℔. of other currants, at 6d. per ℔. : What is the value of 1 ℔. of the mixture?—— *Anſw.* 4½ d.

lb. *d.* *d.*
30, at 4 amounts to 120
10, at 6 ———— 60
40 180
lb. *d.* *lb.* *d.*
If 40 : 180 : : 1 : 4½

Note 1. When the quantity of each ſimple is the ſame, the rate of the mixture is readily found by adding the rates of the ſimples, and dividing their ſum by the number of ſimples. Thus,

Suppoſe a grocer mixes ſeveral ſorts of ſugar, and of each an equal quantity, viz. at 50s. at 54s. and at 60s. per cwt. the rate of the mixture will be 54s. 8d. per cwt. ; for

s. *s.* *d.*
50+54+60=164, and 3) 164) 54 8

Note 2. If it be required to increaſe or diminiſh the quantity of the mixture, ſay, As the ſum of the given quantities of the ſimples, to the ſeveral quantities given ; ſo the quantity of the mixture propoſed, to the quantities of the ſimples ſought.

Note 3. If it be required to know how much of each ſimple is an aſſigned portion of the mixture, ſay, As the quantity of the mixture, to the ſeveral quantities of the ſimples given ; ſo the quantity of the aſſigned portion, to the quantities of the ſimples ſought. Thus,

Suppoſe a grocer mixes 10 ℔. of raiſins with 30 ℔. of almonds and 40 ℔. of currants, and it be demanded, how many ounces of each ſort are found in every pound, or in every 16 ounces of the mixture, ſay,

oz.
80 : 10 : : 16 : 2 raiſins.
80 : 30 : : 16 : 6 almonds.
80 : 40 : : 16 : 8 currants.
——
Proof 16

Note 4. If the rates of two ſimples, with the total value and total quantity of the mixture, be given, the quantity of each ſimple may be found as follows, viz. Multiply the leſſer rate into the total quantity, ſubtract the product from the total value, and the remainder will be equal to the product of the exceſs of the higher rate above the lower, multiplied into the quantity of the higher-priced ſimple ; and conſequently the ſaid remainder, divided by the difference of the rates, will quote the ſaid quantity. Thus,

Suppoſe a grocer has a mixture of 400 ℔. weight, that coſt him 7l. 10s. conſiſting of raiſins at 4d. per ℔. and almonds at 6d. how many pounds of almonds were in the mixture?

lb. *Rates.*
400 6 d.
£. *s.* *d.* 4 4d.
7 10=1800 —— ——
1600 1600d. 2d.
——
£. *s.*
2)200(100℔. of almonds at 6 d. is 2 10
And 300 ℔. of raiſins at 4d. is 5 0
—— ——
Total 400 Proof 7 10

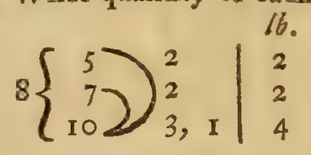
Alligation Alternate, being the converſe of alligation medial, from the rates of the ſimples, and rate of the mixture given, finds the quantities of the ſimples.

Rules. I. Place the rate of the mixture on the left ſide of a brace, as the root ; and on the right ſide of the brace ſet the rates of the ſeveral ſimples, under one another, as the branches. II. Link or alligate the branches, ſo as one greater and another leſs than the root may be linked or yoked together. III. Set the difference betwixt the root and the ſeveral branches right againſt their reſpective yoke-fellows. Theſe alternate differences are the quantities required. Note, 1, If any branch happen to have two or more yoke-fellows, the difference between the root and theſe yoke-fellows muſt be placed right againſt the ſaid branch, one after another, and added into one ſum. 2. In ſome queſtions, the branches may be alligated more ways than one ; and a queſtion will always admit of ſo many anſwers as there are different ways of linking the branches.

Alligation alternate admits of three varieties, viz. 1. The queſtion may be unlimited, with reſpect both to the quantity of the ſimples and that of the mixture. 2. The queſtion may be limited to a certain quantity of one or more of the ſimples. 3. The queſtion may be limited to a certain quantity of the mixture.

Variety I. When the queſtion is unlimited, with reſpect both to the quantity of the ſimples and that of the mixture, this is called *Alligation Simple*.

Examp. A grocer would mix ſugars, at 5 d. 7d. and 10d. per ℔. ſo as to ſell the mixture or compound at 8 d. per ℔.: What quantity of each muſt he take?



Here the rate of the mixture 8 is placed on the left ſide of the brace, as the root ; and on the right ſide of the ſame brace are ſet the rates of the ſeveral ſimples, viz. 5, 7, 10, under one another, as the branches ; according to Rule I.

The branch 10 being greater than the root, is alligated or linked with 7 and 5, both theſe being leſs than the root ; as directed in Rule II.

The difference between the root 8 and the branch 5, viz. 3, is ſet right againſt this branch's yoke-fellow 10. The difference between 8 and 7 is likewiſe ſet right againſt the yoke-fellow 10. And the difference betwixt 8 and 10, viz. 2, is ſet right againſt the two yoke-fellows 7 and 5 ; as preſcribed by Rule III.

As the branch 10 has two differences on the right, viz. 3 and 1, they are added; and the anſwer to the queſtion is, that 2 ℔. at 5 d. 2 ℔. at 7 d. and 4 ℔. at 10 d. will make the mixture required.

The truth and reaſon of the rules will appear by conſidering, that whatever is loſt upon any one branch is gained upon its yoke-fellow. Thus, in the above example, by ſelling 4 ℔. of 10 d. ſugar at 8 d. per ℔. there is 8 d. loſt; but the like ſum is gained upon its two yoke-fellows; for by ſelling 2 ℔. of 5 d. ſugar at 8 d. per ℔. there is 6 d. gained; and by ſelling 2 ℔. of 7 d. ſugar at 8 d. there is 2 d. gained; and 6 d. and 2 d. make 8 d.

Hence it follows, that the rate of the mixture muſt always be mean or middle with reſpect to the rates of the ſimples; that is, it muſt be leſs than the greateſt, and greater than the leaſt; otherwiſe a ſolution would be impoſſible. And the price of the total quantity mixed, computed at the rate of the mixture, will always be equal to the ſum of the prices of the ſeveral quantities caſt up at the reſpective rates of the ſimples.

Variety II. When the queſtion is limited to a certain quantity of one or more of the ſimples, this is called *Alligation Partial.*

If the quantity of one of the ſimples may be limited, alligate the branches, and take their differences, as if there had been no ſuch limitation; and then work by the following proportion;

As the difference right againſt the rate of the ſimple whoſe quantity is given,
To the other differences reſpectively;
So the quantity given,
To the ſeveral quantities ſought.

Examp. A diſtiller would, with 40 gallons of brandy at 12 s. per gallon, mix rum at 7 s. per gallon, and gin at 4 s. per gallon: How much of the rum and gin muſt he take, to ſell the mixture at 8 s. per gallon?

Gal.

$$8\left\{\begin{array}{l}12\\7\\4\end{array}\right.\;\begin{array}{l}1,4\\4\\4\end{array}\left|\begin{array}{c}5\\4\\4\end{array}\right|\begin{array}{l}\text{40 of brandy.}\\\text{32 of rum.}\\\text{32 of gin.}\end{array}\left.\vphantom{\begin{array}{l}1\\1\\1\end{array}}\right\}\textit{Anſ.}$$

The operation gives for anſwer, 5 gallons of brandy, 4 of rum, and 4 of gin. But the queſtion limits the quantity of brandy to 40 gallons; therefore ſay,

If 5 : 4 : : 40 : 32.

The quantity of gin, by the operation, being alſo 4, the proportion needs not be repeated.

Variety III. When the queſtion is limited to a certain quantity of the mixture, this is called *Alligation Total.*

After linking the branches, and taking the differences, work by the proportion following:

As the ſum of the differences,
To each particular difference:
So the given total of the mixture,
To the reſpective quantities required.

Examp. A vintner hath wine at 3 s. per gallon, and would mix it with water, ſo as to make a compoſition of 144 gallons, worth 2 s. 6 d. per gallon: How much wine, and how much water, muſt he take?

Gal.

$$30\left\{\begin{array}{r}36\\0\end{array}\right)\begin{array}{r}30\\6\\\hline 36\end{array}\left|\begin{array}{r}\text{120 of wine.}\\\text{24 of water.}\\\hline\text{144 total.}\end{array}\right.\;\left.\vphantom{\begin{array}{l}1\\1\end{array}}\right\}\textit{Anſw.}$$

$$\begin{array}{r}120\times36=4320\\24\times\;\;0=\quad\;\;0\\\hline\end{array}$$

Proof 144)4320(30

As 36 : 30 : : 144 : 120

As 36 : 6 : : 144 : 24.

There being here only two ſimples, and the total of the mixture limited, the queſtion admits but of one anſwer.

ALLIGATOR, in zoology, a ſynonyme of the lacerta crocodilus. See LACERTA.

ALLIGATOR Pear. See LAURUS.

ALLIONIA, in botany, a genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 48th order, *Aggregatæ*. The characters are: The common *calyx* is oblong, ſimple, three-flowered, five-parted, and perſiſtent; the proper one, obſcure, above: The proper *corolla* is monopetalous and funnel-ſhaped; the mouth quinquefid and erect: The *ſtamina* conſiſt of four briſtly filaments, longer than the corolla, and bending to one ſide; the antheræ are roundiſh: The *piſtillum* has an oblong germen beneath; the *ſtylus* is briſtly, and longer than the ſtamina; the ſtigmata are multifid and linear: There is no *pericarpium*: The *ſeeds* are ſolitary, oblong, and naked: The *receptaculum* is naked. There are two ſpecies, the violeacea and incarnata, both natives of America.

ALLIOTH, a ſtar in the tail of the greater bear, much uſed for finding the latitude at ſea.

ALLITERATION, an ornament of language chiefly uſed in poetry, and conſiſting in the repetition of the ſame letter at certain intervals. We do not remember to have ever ſeen any ſatisfactory account of alliteration in the writings of the critics. They ſeem to have paſſed it over in contemptuous ſilence; either as a falſe refinement or as a mere trifle. It perhaps deſerves a better fate. Many chapters have been compoſed on quantity, on the expreſſion reſulting from different arrangements of long and ſhort ſyllables, and on the powers of pauſes as they are variouſly placed, without a word of alliteration. This is the more extraordinary, as one ſhould think it impoſſible for any man to examine minutely, and, as it were, diſſect a number of verſes, without perceiving the vaſt abundance of this ornament. It is as if an anatomiſt ſhould publiſh a complete table of the arteries in the human body, and affect never to have ſeen a vein nor a nerve: for it may be affirmed, with ſmall danger of miſtake, that if you examine any number of verſes, remarkable either for ſweetneſs or for energy, they will be found in ſome degree alliterative. We do not pretend to ſay, that the ſweetneſs and energy of verſification depends chiefly on this circumſtance, yet we cannot help believing that it may claim ſome ſhare: for it is a conſtant appearance, as far as we have ever obſerved, that the poets whoſe fame is higheſt for verſification, are moſt extenſive dealers in this article.

The trifling poor appearance of the ornament itſelf, upon a ſuperficial view, and the frequent abuſe of it, are circumſtances indeed which give no encouragement to a ſerious enquiry into its nature and operation. How common is it for writers, who affect to be comic, when in want of other means for raiſing a ſmile, to uſe affected alliteration with ſucceſs. But, in the fine arts, no beauty nor grace is beyond the power of ridicule. The nobleſt attitudes in painting have been rendered laughable by caricatura. St Paul preaching at Athens, in the deſign of Raphael, appears elegant, noble, and in ſome degree awful. The ſame apoſtle, repreſented by Hogarth in nearly the ſame attitude, pleading before the governor Felix, ſeems altogether ridiculous. So the language and verſification of Milton in the Paradiſe Loſt appear only proper for the moſt elevated ſubjects. In the Splendid Shilling of Philips, they appear equally proper for the loweſt. So fares it alſo with alliteration. Nor ought we to be mortified at the diſcovery, that much of the delight afforded by verſification ariſes from a cauſe ſo pitiful as the repetition of the ſame letter twice, or oftener, on the accented parts of a verſe; for there are many other cauſes of pleaſure, which, when thus detected and taken to pieces, ſeem equally contemptible.

We apprehend the principal operation of this ornament to be quite mechanical. It is eaſier for the organs of ſpeech to reſume, at ſhort intervals, one certain conformation, than to throw themſelves into a number of different ones, unconnected and diſcordant. For example, a ſucceſſion of labials, interſperſed at regular diſtances with dentals and gutturals, will be more eaſily pronounced than the ſucceſſion of all the three at random. Sounds of which the articulation is eaſieſt, are moſt completely in the power of the ſpeaker. He can pronounce them ſlowly or rapidly, ſoftly or with force, at pleaſure. In this we imagine the power and advantage of alliteration is founded: for we would not lay any ſtreſs on the pleaſure which can reſult to the ear from the repetition of the ſame letter. It has been compared to the frequent returns of the key-note in a muſical ſtrain; but that analogy is extremely faint. The ear, we preſume, can be pleaſed with alliteration only in ſo far as it contributes to the ſuperior eaſineſs of recitation; for what is recited with eaſe muſt be heard with pleaſure.

Theſe remarks might be confirmed and illuſtrated by numberleſs paſſages from the beſt poets. Some few lines will ſuffice, taken from Gray, who ſeems to have paid particular attention to this grace. He profeſſed to have learned his verſification from Dryden, as Dryden did from Spencer; and theſe three abound in alliteration above all the Engliſh poets. We chooſe Gray for another reaſon, in proof of what we mentioned before, that alliteration contributes not only to the *ſweetneſs*, but alſo to the *energy*, of verſification; for he uſes it chiefly when he aims at ſtrength and boldneſs. In the *Siſter Odes* (as Dr Johnſon ſtyles them), almoſt every ſtrophe commences and concludes with an alliterative line. The poet, we ſuppoſe, wiſhed to begin with force, and end with dignity.

"*R*uin ſeize thee, *r*uthleſs king."
"To *h*igh-born *H*oel's *h*arp, or ſoft *L*lewe*l*lyn's *l*ay."
"*W*eave the *w*arp, and *w*eave the *w*oof."
"Stamp we our vengeance *d*eep, and ratify his *d*oom."
"Regardleſs of the *ſ*weeping whirlwind's *ſ*way."
"That huſh'd in grim re*p*oſe, ex*p*ects his ev'ning *p*rey."

It muſt be obſerved here, that we hold a verſe alliterative which has a letter repeated on its accented parts, although thoſe parts do not begin words; the repeated letter bearing a ſtrong analogy to the bars in a muſical phraſe. Gray ſeems to have had a particular liking to theſe ſort of balanced verſes, which divide equally, and of which the oppoſite ſides have an alliterative reſemblance.

"Eyes that *g*low, and fangs that *g*rin,
"Thoughts that *b*reathe, and words that *b*urn."
"*H*auberk craſh, and *h*elmet ring."

All theſe lines appear to us to have a force and energy, ariſing from alliteration, which renders them eaſy to be recited; or, if the reader pleaſes, *mouthed*. For the ſame reaſon the following paſſage appears ſad and ſolemn, by the repetition of the labial liquid.

"*M*ountains, ye *m*ourn in vain."
"*M*odred, whoſe *m*agic ſong,"—&c.

If alliteration thus contributes to enforce the expreſſion of a poetical ſentiment, its advantages in poetry muſt be conſiderable. It is not, therefore, unworthy a poet's regard in the act of compoſition. If two words offer of equal propriety, the one alliterative the other not, we think the firſt ought to be choſen. We would compare this to the practice of fuguing in muſic. A compoſer who aims at expreſſion will not hunt after fugues; but if they offer, if they ſeem to ariſe ſpontaneouſly from the ſubject, he will not reject them. So a good poet ought not to ſelect an epithet merely for beginning with a certain letter, unleſs it ſuit his purpoſe well in every other reſpect; for the beauty of alliteration, when happy, is not greater than its deformity when affected. A couplet from Pope will exemplify both; the firſt line being bad, and the ſecond good:

"Eternal beauties grace the *ſ*hining *ſ*cene,
"*F*ields ever *f*reſh, and *g*roves for ever *g*reen."

ALLIUM (from 'αλεω, "to avoid or ſhun," becauſe many ſhun the ſmell of it), GARLIC: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method ranking in the 9th order, *Spathaceæ*. The characters are: The *calyx* is a common ſpatha, roundiſh, withering, and multiflorous: The *corolla* conſiſts of ſix oblong petals: The *ſtamina* have ſix ſubulated filaments, often the length of the corolla; the antheræ are oblong and erect: The *piſtillum* has a germen above, ſhorter, nearly three-cornered, with angles engraved with a line; the ſtyli are ſimple, the ſtigmata acute: The *pericarpium* is a very ſhort, broad, three-lobed capſule, with three cells and three valves: The *ſeeds* are many and roundiſh. Of this genus no fewer than 40 different ſpecies are enumerated by Linnæus, among which he includes the cepa and porrum, or onions and leeks.

1. The ſativum, or garlic, has a bulbous root, of an irregularly roundiſh ſhape, with ſeveral fibres at the bottom; each root is compoſed of a number of leſſer bulbs, called *cloves* of garlic, incloſed in one common membranous

membranous coat, and eaſily ſeparable from one another. All the parts of this plant, but more eſpecially the roots, have an acrimonious, and almoſt cauſtic taſte, with a ſtrong offenſive ſmell, which laſt has induced thoſe who preſerved ſome of the ſpecies in gardens on account of their yellow flowers to eradicate them.

This pungent root warms and ſtimulates the ſolids, and attenuates tenacious juices; for which it is well adapted, on account of its being very penetrating; inſomuch that, when applied to the feet, its ſcent is ſoon diſcovered in the breath; and, when taken internally, its ſmell is communicated to the urine, or the matter of an iſſue, and perſpires through the pores of the ſkin. Hence, in cold eucophlegmatic habits, it proves a powerful expectorant, diuretic, and emmenagogue; and if the patient is kept warm, ſudorific. It is alſo of great ſervice in humoral aſthmas and catarrhous diſorders of the breaſt, and in other diſorders proceeding from a laxity of the ſolids, and cold ſluggiſh indiſpoſitions of the fluids. It is alſo frequently of ſervice in the dropſy; in the beginning of which it is particularly recommended by Sydenham, as a warm ſtrengthening medicine: we have even many examples where it acts ſo powerfully as a diuretic, as to carry off all the water of dropſies. It may be taken the length of a dram or two in ſubſtance for a doſe.—There is a ſyrup and oxymel made with it, which may be employed for the ſame purpoſes as the garlic in ſubſtance; but they are moſtly uſed in pulmonic diſorders.—Externally applied, it inflames and ulcerates the ſkin, and is ſometimes employed for this uſe in ſinapiſms. It has alſo been recommended by Sydenham as a moſt powerful revellent; for which purpoſe he was led to make uſe of it in the confluent ſmall-pox. His method was to cut the root in pieces, and apply it, tied in a linen cloth, to the ſoles of the feet, about the eighth day of the diſeaſe, after the face began to ſwell; renewing it once a-day till the danger was over.—When made into an unguent with oils, and applied externally, garlic is ſaid to reſolve and diſcuſs cold tumours, and has been by ſome greatly celebrated in cutaneous diſorders.

The acrimonious qualities of this root, however, render it manifeſtly improper on many occaſions. Its liberal uſe is apt to occaſion head-achs, flatulencies, thirſt, febrile heats, inflammatory diſtempers, and ſometimes diſcharges of blood from the hemorrhoidal veſſels. In hot bilious conſtitutions, where there is already a degree of irritation, where the juices are too thin and acrimonious, or the viſcera unſound, it never fails to aggravate the diſtemper.

In Kamtſchatka, the allium urſinum, or wild garlic, is very common and uſeful in medicine as well as food. Both Ruſſians and natives gather it in great quantities for winter ſervice. They ſteep it in water, then mix it with cabbage, onions, and other ingredients, and form out of them a ragout which they eat cold. It is alſo the principal remedy for the ſcurvy. As ſoon as this plant appears above the ſnow, they ſeem to put this dreadful diſorder at defiance, and find a cure almoſt in its worſt ſtages.

Garlic is very hardy, and will thrive in almoſt any ſoil or ſituation. It is eaſily propagated either by the roots or ſeeds. If from the roots, they ought to be planted in autumn, that they may take good root in the ground before the ſpring, which is neceſſary to make them flower ſtrong the following ſummer. If they are propagated by ſeeds, they may be ſown on a border of common earth, either in autumn ſoon after the ſeeds are ripe, or in the ſpring following; and will require no farther care than to keep them clear from weeds. In the following autumn, they may be tranſplanted into the borders where they are to remain.

2. The aſcalonicum, or eſchalot, was found wild in Paleſtine by Dr Haſſelquiſt. The root is conglobate, conſiſting of many oblong roots bound together by thin membranes. Each of theſe ſmall roots ſends forth two or three fiſtulous, long, awl-ſhaped leaves, iſſuing from a ſheath, and are nearly like thoſe of the common onion. The flower-ſtem ſhoots from a membranaceous ſheath; is round, almoſt naked, and terminated by a globular umbel of flowers, which have erect, purpliſh, lance-ſhaped petals, of the length of the ſtamina.—The root of this ſpecies it very pungent, has a ſtrong, but not unpleaſant ſmell, and therefore is generally preferred to the onion for making high-flavoured ſoups and gravies. It is alſo put into pickles, and in the Eaſt Indies they uſe an abundance of it for this purpoſe.

3. The ſcorodopraſum, or rokambole, grows naturally in Denmark and Sweden. It hath a heart-ſhaped ſolid root, which ſtands ſidewiſe of the ſtalk. The leaves are broad, and are a little crenated on their edges. The flowers are of a pale purple colour, and collected into a globular head. The roots are uſed for the ſame purpoſe as the former.

4. The ſchœnopraſum, orcivis, is an inhabitant of Siberia, and a very ſmall plant compared with the former, the leaves and ſtems ſeldom exceeding ſix inches in length, and the roots never producing any bulbs. The leaves are awl-ſhaped, hollow, and the ſtem naked. It was formerly in great requeſt for mixing with ſalads in the ſpring, but has been little regarded lately. Its taſte, ſmell, and virtues, are much the ſame as thoſe of the common onion. It is propagated by parting the roots.

5. The cepa, or common onion, differs from the garlic only in the ſwelling pipy ſtalk, which is much larger in the middle than at either end.—From whence this was firſt brought into Europe is not known; but that it is natural to Africa is beyond a doubt, it being evident that onions were eaten by the Egyptians above 2000 years before Chriſt; and they make a great part of their conſtant food to this day in Egypt. Dr Haſſelquiſt ſays it is not to be wondered at that the Iſraelites ſhould long for them after they had left this place; for whoever has taſted onions in Egypt muſt allow, that none can be had better in any part of the univerſe. Here, he obſerves, they are ſweet, in other countries they are nauſeous and ſtrong. Here they are ſoft; whereas in the northern and other parts they are hard, and their coats ſo compact that they are difficult to digeſt. They eat them roaſted, cut into four pieces, with ſome bits of roaſted meat, which the Turks call *kebab;* and with this diſh they are ſo delighted, that they wiſh to enjoy it in paradiſe. They likewiſe make a ſoup of them in Egypt, which Haſſelquiſt ſays is one of the beſt diſhes he ever ate. The many ways of dreſſing onions in Britain are known to every family: but in regard to wholeſomeneſs, there is certainly no method equal to boiling; as thus they are rendered mild, of eaſy digeſtion, and go off without leaving thoſe heats in the ſtomach and bowels, which

Allium.

Allium. Allix.

which they are apt to do any other way. Their nature is to attenuate thick, viſcid juices; conſequently a plentiful uſe of them in cold phlegmatic conſtitutions muſt prove beneficial. Many people ſhun them on account of the ſtrong, diſagreeable ſmell they communicate to the breath. This may be remedied by eating a few raw parſley leaves immediately after, which will effectually overcome the ſcent of the onions, and cauſe them to ſit more eaſy on the ſtomach.

The varieties are, the Straſburgh, the Spaniſh, and the Egyptian onion. They are propagated by ſeeds, which ſhould be ſown the latter end of February, or the beginning of March, on good, light, rich ground, well dug and levelled, and cleared from weeds. They ſhould alſo be ſown at a time when the ſurface of the ground is not moiſt; and where they are intended for a winter crop, they muſt not be ſown too thick. The common allowance is ſix pounds of ſeed to an acre; though ſome allow more, in order to have a crop to draw out, which they call *cullings*. In about ſix weeks after, the onions will be up, and forward enough to hoe; at which time the weeds ſhould be lightly cut up with a ſmall hoe about two inches and a half broad, as alſo the onions themſelves, where they grow too cloſe in bunches, leaving them at this firſt time at leaſt two or three inches apart. This, if properly performed, and in a dry ſeaſon, will preſerve the ground clear of weeds at leaſt a month, when they muſt be hoed over again, leaving them at this time about four or five inches aſunder. In ſix weeks after they muſt be hoed a third time. The weeds are now to be carefully cut up, and the onions ſingled out ſo as to leave them about ſix inches ſquare; by which means they will grow much larger than if left too cloſe. This, if well performed, in caſe the weather proves dry, will keep the onions till they are fit to pull: but if the weather ſhould prove moiſt, and any of the weeds take root again, the weeds muſt be pulled out with the hand; for the onions having now begun to bulb, muſt not be diſturbed with a hoe. Towards the middle of Auguſt the onions will have arrived at their full growth, which may be known by their blades falling to the ground and ſhrinking. At this time, therefore, before their necks or blades are withered off, they ſhould be drawn out of the ground, the extreme part of the blade cut off, and the onions laid upon a dry ſpot of ground, obſerving to turn them every other day at leaſt, to prevent them from taking root again; which in moiſt weather they would be apt to do. At any rate, they are very apt to grow in the lofts where they are kept all winter; the moſt effectual method of preventing which is, with a hot iron, ſlightly to touch their beards or roots, which will effectually prevent their ſprouting; but in doing this, great caution muſt be uſed not to ſcorch the pulp, for that will cauſe them to periſh ſoon after. In order to ſave ſeeds, you muſt in the ſpring make choice of ſome of the largeſt, firmeſt, and beſt ſhaped onions (in quantity proportionable to the ſeed you intend to ſave), and having prepared a piece of good ground, which ſhould be well dug, and laid out in beds about three feet wide, the onions muſt be planted in the beginning of March, in the following manner: Having ſtrained a line of about four inches within the ſide of the bed, you muſt with a ſpade throw out an opening ſix inches deep, the length of the bed, into which you ſhould place the onions with their roots downward, at about nine inches diſtance from each other; and with a rake draw the earth into the opening again to cover the bulbs; then proceed to remove the line again about a foot farther back, where you muſt make an opening as before, and ſo again, till the whole is finiſhed, by which you will have four rows in each bed; between each bed you muſt allow the ſpace of two feet for an alley to go among them. In a month's time the leaves will appear above ground, and many of the roots will produce three or four ſtalks each. About the beginning of June, when the flowers begin to appear, the ſtalks muſt be tied to ſtakes to prevent them from being broke by their own weight. About the end of Auguſt the ſeed will be ripe; which may be known by the opening of the cells which contain it, and its changing to a brown colour. When the heads are cut off, they ſhould be ſpread abroad upon coarſe cloths in the ſun, obſerving to keep it under ſhelter in the night, as alſo in wet weather. When the heads are quite dry, the ſeeds ſhould be beat out from them; and after being cleared from the huſks, and expoſed one day to the ſun to dry, they may be put up in bags for uſe.

Beſides the above-mentioned ſorts of onions, the ſcallions, or eſcallions, and Welſh onions, were formerly in great repute. The former is a ſort which never forms any bulbs at the roots, and was chiefly uſed in the ſpring for green onions; but is now become ſo ſcarce as hardly to be known. Some gardeners, inſtead of the ſcallion, ſubſtitute ſuch onions as decay and ſprout in the houſe. Theſe they plant in a bed early in the ſpring, and in a ſhort time they become large enough for uſe. The true ſcallion is eaſily propagated by parting the roots either in the ſpring or autumn; but the latter is preferable. The roots ſhould be planted three or four in a hole, and about ſix inches diſtance every way.—The Welſh onions are propagated only for ſpring uſe; they never make any bulbs, and are therefore fit only to be uſed green for ſalads. They are ſown in the end of July, in beds about three feet and a half wide. In a fortnight's time they appear above ground; but in October their blades die, and the ground becomes quite naked. In January, however, they will again appear very ſtrong, and in March will be fit to draw for young onions.

6. The porrum, or leek, has been ſo long cultivated, that its native place of growth cannot be traced. It is undoubtedly the ſame as that mentioned in the eleventh chapter of Numbers, where it is ſaid the Iſraelites longed for leeks in conjunction with onions. The leaves are much of the ſame nature as thoſe of the latter, and they are yet a conſtant diſh at the tables of the Egyptians, who chop them ſmall and then eat them with their meat. They are in great eſteem, too, with the Welſh, and their general uſe as a pot-herb is well known.—Their culture is the ſame with that of the onion.

ALLIX (Dr Peter), a learned French Proteſtant divine, born at Alençon in 1641. He became miniſter of the reformed church at Rouen, where he publiſhed many learned and curious pieces; the credit of which induced the reformed to call him to Charenton, about a league from Paris, being the principal church they had in France. On the revocation of the edict of Nantz, he retired to England; where he ſtudied the language with ſo much ſucceſs, as to publiſh a work, intitled *Reflexions on the Books in the Holy Scriptures, to eſtabliſh the truth of the Chriſtian Religion*, 2 vols; which he dedicated to James II. acknowledging his obligations to that prince, and his kind behaviour to the diſtreſſed refugees in general. He wrote ſeveral other treatiſes relating to eccleſiaſtical hiſtory; which rendered him as famous in England as in France, for his ingenious and ſolid defences of the reformed religion. He was complimented with the degree of D. D. and in 1690 was made treaſurer of the church of Saliſbury. He died in 1717.

ALLOA, or ALLOWAY, a ſea-port town in Scotland, ſeated on the Forth, about 20 miles higher up the river than Leith, and five miles eaſt of Stirling. It is a populous place; has two market-days in the week, and is remarkable for its fine caſtle the ſeat of the earl of Mar, and for the coal-mines near it. The harbour is extremely commodious, with great depth of water; and veſſels are expeditiouſly loaded with coals from the pits by an uncommon waggon-way, on which one horſe draws with eaſe three waggons at once, each waggon containing a tun and a half. An excellent dry-dock has alſo been lately erected here, capable of receiving ſhips of the greateſt burden. There is likewiſe a large glaſs-houſe for blowing bottles, of which veſſels are ſupplied with any quantity upon the ſhorteſt notice.

The tower and lands of Alloa were exchanged by David II. king of Scots, *anno* 1365, with Thomas Lord Erſkine, for the lands and eſtate of Strathgartney in Perthſhire; and ſince that time the caſtle of Alloa has been the favourite reſidence of the family of Mar. The ſituation is uncommonly beautiful. The gardens here were the firſt that were laid out on a great ſcale in Scotland; and, with the advice of Le Nautre, were indebted to the taſte of John the late Earl of Mar, who began to plant them in the year 1706. They contain about 40 acres; and would have exhibited to Dr Johnſon, had he travelled that way, as fine timber of fourſcore years growth as his favourite England can produce.

The tower of Alloa is 89 feet in height, with walls of 11 feet in thickneſs; and was built in the end of the 13th century. In this reſidence of the family of Erſkine many of the Scottiſh princes received their education, having been for more than two centuries the wards of the Lords Erſkine and the Earls of Mar; who held generally the caſtle of Stirling, and frequently the three principal fortreſſes of the kingdom, Edinburgh, Stirling, and Dunbarton. The laſt heir of the Scottiſh monarchy who was nurtured there was Henry Prince of Wales; whoſe cradle, golf-clubs, and other infantine and youthful remains, are preſerved by the heirs of the Earls of Mar, in remembrance of that ſpirited and promiſing prince; of whom Dr Birch has preſerved ſeveral anecdotes, connected with the Erſkines and his reſidence at Alloa.—Among other remains of antiquity preſerved at Alloa, in remembrance of the confidence and affection which ſubſiſted always betwixt the Stuarts and the Erſkines, is the private ſignet of the unfortunate Mary, which ſhe gave to the regent Mar, after ſhe was obliged by the treaty of Edinburgh to deſiſt from wearing the arms of England in the firſt quarter; the child's chair of James VI. her ſon; and the feſtive-chair of Thomas Lord Erſkine the ſecond Earl of Mar of the name, with the faſhionable grace carved on it, *Soli Deo Honor et Gloria.*

ALLOBROGES (Inſcriptions, Livy, Velleius, Flarus); from *Allobrox* (Horace): a people of Gallia Narbonenſis, ſituated between the rivers Iſara and Rhodanus, and the Lacus Lemanus; commended by Cicero for their fidelity, diſcommended by Horace on account of their fondneſs for novelty.

ALLOCATION denotes the admitting or allowing of an article of account, eſpecially in the exchequer. Hence,

ALLOCATIONE Facienda, is a writ directed to the lord treaſurer, or barons of the exchequer, commanding them to allow an accountant ſuch ſums as he has lawfully expended in the execution of his office.

ALLOCUTIO, an oration or ſpeech of a general addreſſed to his ſoldiers to animate them to fight, to appeaſe ſedition, or to keep them to their duty. A mount of earth was raiſed upon the occaſion, as it were a kind of tribunal of turf. From this the general pronounced his harangue to the army, which was ranged in ſeveral ſquadrons round him, with their captains at their head. When the time and circumſtances would not admit of a formal harangue, the general went through the ranks, and called each by his name, putting them in mind of their courage upon former occaſions, mentioning the victories they had won, and making promiſes of plunder.

ALLODIUM, or ALLEUD, denotes lands which are the abſolute property of their owner, without being obliged to pay any ſervice or acknowledgment whatever to a ſuperior lord. See FEE and FEUDAL *Syſtem.*

ALLOPHYLLUS, in botany; a genus of the monogynia order, belonging to the Octandria claſs of plants. The characters of which are: The *calyx* is a four-leaved perianthium, with orbicular leaflets, the oppoſite ones leſs: The *corolla* conſiſts of four orbicular equal petals, leſs than the calyx; the claws broader, the length of the ſmaller leaves of the calyx: The *ſtamina* conſiſt of eight ſlender filaments, the length of the corolla; the antheræ are roundiſh: The *piſtillum* has a round didymous germen above; the ſtylus is filiform, and longer than the ſtamina; and the ſtigma is bifid, with revolute diviſions. There is but one ſpecies, the zeylanicus, a native of Ceylon.

ALLOTTING, or *ALLOTMENT, of Goods*, in matters of commerce, is when a ſhip's cargo is divided into ſeveral parts, bought by divers perſons, whoſe names are written on as many pieces of paper, which are applied by an indifferent perſon to the ſeveral lots or parcels; by which means the goods are divided without partiality, every man having the parcel which the lot with his name on is appropriated.

ALLOY, or ALLAY, properly ſignifies a proportion of a baſer metal mixed with a finer one. The alloy of gold is eſtimated by carats, that of ſilver by pennyweights. (See GOLD, &c.) In different nations, different proportions of alloy are uſed; whence their moneys are ſaid to be of different degrees of fineneſs or baſeneſs, and are valued accordingly in foreign exchanges.—The chief reaſons alleged for the alloying of coin are: 1. The mixture of the metals, which, when ſmelted from the mine, are not perfectly pure. 2. The ſaving the expence it muſt otherwiſe coſt if they were to be refined. 3. The neceſſity of rendering them harder, by mixing ſome parts of other metals with them, to prevent the diminution of weight by wearing in paſſing from hand to hand. 4. The melting of foreign gold or coin which is alloyed. 5. The charges of coinage, which muſt be made good by the profit ariſing from the money coined. 6. and laſtly, The duty belonging to the ſovereign, on account of the power he has to cauſe money to be coined in his dominions.

In a more general ſenſe, the word is employed in chemiſtry to ſignify the union of different metallic matters.—As an infinity of different combinations may be made according to the nature, the number, and the proportions of the metallic matters capable of being alloyed, we ſhall not here enter into the detail of the particular alloys, all which are not yet nearly known. Thoſe which are uſed, as *Bronze*, *Tombac*, *Braſs*, *White Copper*, &c. may be found under their particular names; and what is known concerning other alloys may be found under the names of the different metals and ſemimetals.

ALLUM. See ALUM.

ALLUMINOR, from the French *alumer*, "to lighten," is uſed for one who coloureth or painteth upon paper or parchment; and the reaſon is, becauſe he gives light and ornament by his colours to the letters or other figures. Such ornaments are ſtyled *illuminations*. The word is uſed in ſtat. 1. R. III. cap. 9. But now ſuch a perſon is called a *limner*.

ALLUSH, (anc. geog.) The Iſraelites being in the wilderneſs of Shur, departed from Dophkah, and went to Alluſh, from whence they proceeded to Rephidim; Num. xxxiii. 13, 14. Euſebius and St Jerom fix Alluſh in Idumæa, about Gabala or Petra, the capital of Arabia Petræa. In the accounts of the empire, it is ſituated in the third Paleſtine; and by Ptolemy, among the cities of Idumæa.

ALLUSION, in rhetoric, a figure by which ſomething is applied to, or underſtood of, another, on account of ſome ſimilitude between them.

ALLUVION, in law, denotes the gradual increaſe of land along the ſea-ſhore, or on banks of rivers.

ALLY, in matters of polity, a ſovereign prince or ſtate that has entered into alliance with others. See ALLIANCE.

ALMACANTARS. See ALMUCANTARS.

ALMACARRON, a ſea-port town of Spain, in the province of Murcia, at the mouth of the river Guadalantin. It is about twenty miles weſt of Carthagena, and is remarkable for the prodigious quantity of alum found in its territory. W. Long. 1. 15. N. Lat. 37. 40.

ALMADE, a town of Spain, in the province of La Mancha, in the kingdom of Caſtile, ſituated upon the top of a mountain, where are the moſt ancient as well as the richeſt ſilver mines in Europe.

ALMADIE, a kind of canoe, or ſmall veſſel, about four fathoms long, commonly made of bark, and uſed by the negroes of Africa.

ALMADIE is alſo the name of a kind of long-boats, fitted out at Calicut, which are eighty feet in length, and ſix or ſeven in breadth. They are exceedingly ſwift, and are otherwiſe called *cathuri*.

ALMAGEST, in matters of literature, is particularly uſed for a collection or book compoſed by Ptolemy, containing various problems of the ancients both in geometry and aſtronomy.

ALMAGEST is alſo the title of other collections of this kind. Thus, Riccioli has publiſhed a book of aſtronomy, which he calls the *New Almageſt*; and Pluckenet, a book which he calls *Almageſtrum Botanicum*.

ALMAGRA, a fine deep red ochre, with ſome admixture of purple, very heavy, and of a denſe yet friable ſtructure, and rough duſty ſurface. It adheres very firmly to the tongue, melts freely and eaſily in the mouth, is of an auſtere and ſtrongly aſtringent taſte, and ſtains the ſkin in touching. It is the *Sil Atticum* of the ancients: it ferments very violently with acid menſtruums; by which ſingle quality, it is ſufficiently diſtinguiſhed from the *Sil Syricum*, to which it has in many reſpects a great affinity. It is found in immenſe quantities in many parts of Spain; and in Andaluſia there are in a manner whole mountains of it. It is uſed in painting, and in medicine as an aſtringent.

ALMAGRO, a fortreſs of Spain, the capital of one of the diſtricts of La Mancha. It was built by the archbiſhop Roderic of Toledo, who finiſhed it in 1214, and put a conſiderable garriſon into it to reſtrain the incurſions of the Moors. This was hardly done, when the fortreſs was beſieged by an army of 5000 horſe and foot, under the command of a Mooriſh officer of great reputation; but the prelate, its founder, took care to ſupply thoſe within with ſuch plenty of neceſſaries, that at length the enemy found themſelves obliged to raiſe the ſiege and retire with great loſs.

ALMANACK, a book, or table, containing a calendar of days and months, the riſing and ſetting of the ſun, the age of the moon, the eclipſes of both luminaries, &c.—Authors are divided with regard to the etymology of the word; ſome deriving it from the Arabic particle *al* and *manach*, to count; ſome from *almanah*, new-year's gifts, becauſe the Arabian aſtrologers uſed at the beginning of the year to make preſents of their ephemerides; and others, from the Teutonic *almaen-achte*, obſervations on all the months. Mr Johnſon derives it from the Arabic particle *al*, and the Greek μην, a month. But the moſt ſimple etymology appears from the common ſpelling; the word being compoſed of two Arabic ones, *Al Manack*, which ſignify *the Diary*. All the claſſes of Arabs are commonly much given to the ſtudy of aſtronomy and aſtrology; to both which a paſtoral life, and a ſort of huſbandry, not only incline them, but give them time and leiſure to apply themſelves to them. They neither ſow, reap, plant, travel, buy or ſell, or undertake any expedition or matter, without previouſly conſulting the ſtars, or, in other words, their almanacks, or ſome of the makers of them. From theſe people, by their vicinity to Europe, this art, no leſs uſeful in one ſenſe than ſtupid and ridiculous in another, hath paſſed over thither: and thoſe aſtronomical compoſitions have ſtill every where not only retained their old Arabic name; but were, like theirs, for a long while, and ſtill are among many European nations, interſperſed with a great number of aſtrological rules for planting, ſowing, bleeding, purging, &c. down to the cutting of the hair and paring of the nails.—Regiomontanus appears to have been the firſt in Europe, however, who reduced almanacks into their preſent form and method, gave the characters of each year and month, foretold the eclipſes and other phaſes, calculated the motions of the planets, &c. His firſt almanack was firſt publiſhed in 1474.

Almanacks differ from one another, chiefly, in containing ſome more, others fewer, particulars.

The eſſential part is the calendar of months and days, with the riſings and ſettings of the ſun, age of the moon, &c. To theſe are added various parerga, aſtronomical, meteorological, chronological, political, rural, &c. as calculations and accounts of eclipſes, ſolar ingreſſes, prognoſtics of the weather, tables of the tides, terms, &c. liſts of poſts, offices, dignities, public inſtitutions, with many other articles political as well as local, and differing in different countries.—A great variety are annually publiſhed, ſome for binding, which may be denominated *book-almanacks;* others in looſe paper, called *ſheet-almanacks.*

The modern almanack anſwers to the *Faſti* of the ancient Romans. See FASTI.

Conſtruction of ALMANACKS. The firſt thing to be done is, to compute the ſun's and moon's place for each day of the year, or it may be taken from ſome ephemerides and entered into the almanack; next, find the dominical letter, and, by means thereof, diſtribute the calendar into weeks; then, having computed the time of eaſter, by it fix the other moveable feaſts; adding the immoveable ones, with the names of the martyrs, the riſing and ſetting of each luminary, the length of day and night, the aſpects of the planets, the phaſes of the moon, and the ſun's entrance into the cardinal points of the ecliptic, *i. e.* the two equinoxes and ſolſtices. (See ASTRONOMY, *paſſim.*) By the help of good aſtronomical tables or ephemerides, the conſtruction of almanacks is extremely eaſy.

In Britain, almanacks for one year printed on one ſide of the paper, pay of duty 4d.; thoſe for more years pay for three years 1d.; but perpetual almanacks are to pay only for three years at 2d. Out of the duties by this act there ſhall be paid to each univerſity L. 500 *per ann.* half yearly, at Midſummer and Chriſtmas, and the ſurplus ſhall be paid into the exchequer to go to the ſinking fund. Selling unſtamped almanacks incurs the ſame penalty as for ſelling unſtamped newſpapers. Almanacks in bibles and common prayer books are exempted.

ALMANACK, among antiquaries, is alſo the name given to a kind of inſtrument, uſually of wood, inſcribed with various figures and Runic characters, and repreſenting the order of the feaſts, dominical letters, days of the week, and golden number, with other matters neceſſary to be known throughout the year; uſed by the ancient northern nations, in their computations of time, both civil and eccleſiaſtical. Almanacks of this kind are known by various names, among the different nations wherein they have been uſed; as rimſtocks, primſtaries, runſtocks, runſtaffs, *Scipiones Runici, Bacculi Annales*, clogs, &c. They appear to have been uſed only by the Swedes, Danes, and Norwegians. From the ſecond of theſe people, their uſe was introduced into England, whence divers remains of them in the counties. Dr Plot has given the deſcription and figure of one of theſe clogs, found in Staffordſhire, under the title of *The perpetual Staffordſhire Almanack.* The external figure and matter of theſe calendars appear to have been various. Sometimes they were cut on one or more wooden leaves, bound together after the manner of books; ſometimes on the ſcabbards of ſwords, or even on daggers; ſometimes on tools and implements, as portable ſteelyards, hammers, the helves of hatchets, flails, &c. Sometimes they were made of braſs or horn; ſometimes of the ſkins of eels, which, being drawn over a ſtick properly inſcribed, retained the impreſſions of it. But the moſt uſual form was that of walking-ſtaves, or ſticks, which they carried about with them to church, market, &c. Each of theſe ſtaves is divided into three regions; whereof the firſt indicates the ſigns, the ſecond the days of the week and year, and the third the golden number. The characters engraven on them are, in ſome, the ancient Runic; in others, the later Gothic characters of Ulfilus. The ſaints days are expreſſed in hieroglyphics, ſignificative either of ſome endowment of the ſaint, the manner of his martyrdom, or the like. Thus, againſt the notch for the firſt of March, or St David's day, is repreſented a harp; againſt the 25th of October, or Criſpin's day, a pair of ſhoes; againſt the 10th of Auguſt, or St Lawrence's day, a gridiron; and, laſtly, againſt New-year's day, a horn, the mark of good drinking, which they gave a looſe to at that ſeaſon.

ALMANZA, a little town of New-Caſtile, on the frontiers of the kingdom of Valencia in Spain, ſituated in W. Long. 1. 19, N. Lat. 38. 54. It is remarkable for the defeat of the allies in 1707, under the Marquis de las Minas and the Earl of Galway. In the beginning of this action, the Engliſh troops penetrated thro' the centre of the Spaniſh army; but the Portugueſe cavalry being broken by the Spaniſh, and the French infantry making a dreadful fire on their flanks, the allied army was at laſt broken, and began their retreat when it was almoſt dark. Colonel Hill carried off the remains of thirteen battalions towards the river Xucar, which, if they could have paſſed, they might have been ſafe: but being very much fatigued, they were obliged to halt; by which means they were ſurrounded, and forced to ſurrender priſoners of war. In this battle, the allies loſt 120 ſtandards, together with all their artillery and baggage; a great number were killed, and ſeveral thouſands taken priſoners. The Marquis de las Minas was dangerouſly wounded; and his miſtreſs, in the garb of an amazon, killed by his ſide. The earl of Galway had two cuts acroſs the face, which, though not dangerous, had prevented him from ſeeing, or giving orders properly.

HERESY OF ALMARIC, a tenet broached in France by one Almaric, in the year 1209. It conſiſted in affirming, that every Chriſtian was actually a member of Chriſt; and that without this faith no one could be ſaved. His followers went farther, and affirmed, that the power of the Father laſted only during the continuance of the Moſaic law; that the coming of Chriſt introduced a new law; that at the end of this began the reign of the Holy Ghoſt; and that now confeſſion and the ſacraments were at an end, and that every one is to be ſaved by the internal operations of the Holy Spirit alone, without any external act of religion. Their morals were as infamous as their doctrine was abſurd. Their tenets were condemned by a public decree of the council of Sens, in the year 1209.

ALME, or Alma, ſinging and dancing girls in Egypt, who, like the Italian *Improviſatori*, can occaſionally pour forth "unpremeditated verſe." They are called *Almé*, from having received a better education than other women. They form a celebrated ſociety in this country. To be received into it, according to Mr Savary, it is neceſſary to have a good voice, to underſtand the language well, to know the rules of poetry, and be able to compoſe and ſing couplets on the ſpot, adapted to the circumſtances. The Almé know by heart all the new ſongs. Their memory is furniſhed with the moſt beautiful tales. There is no feſtival without them; no entertainment of which they do not conſtitute the ornament. They are placed in a roſtrum, from whence they ſing during the repaſt. They then deſcend into the ſaloon, and form dances which have no reſemblance to ours. They are pantomine ballets, in which they repreſent the uſual occurences of life. The myſteries of love too, generally furniſh them with ſcenes. The ſuppleneſs of their bodies is inconceivable. One is aſtoniſhed at the mobility of their features, to which they give at pleaſure the impreſſion ſuited to the characters they play. The indecency of their attitudes is often carried to exceſs. Their looks, their geſtures, every thing ſpeaks, but in ſo expreſſive a manner, that it is impoſſible to miſtake them. At the beginning of the dance, they lay aſide with their veils the modeſty of their ſex. A long robe of very thin ſilk goes down to their heels, which is ſlightly faſtened with a rich girdle. Long black hair, plaited and perfumed, is flowing on their ſhoulders. A ſhift, tranſparent as gauze, ſcarcely hides their boſom. As they put themſelves in motion, the ſhapes, the contours of their bodies, ſeem to develope themſelves ſucceſſively. Their ſteps are regulated by the ſound of the flute, of caſtanets, the tambour de baſque, and cymbals, which accelerates or retards the meaſure. They are ſtill further animated by words adapted to ſuch ſcenes. They appear in a ſtate of intoxication. They are the Bacchants in a delirium. It is when they are at this point, that throwing off all reſerve, they abandon themſelves totally to the diſorder of their ſenſes; it is then that a people far from delicate, and who like nothing hidden, redouble their applauſes. Theſe Almé are ſent for into all the harams. They teach the women the new airs; they amuſe them with amorous tales, and recite in their preſence poems, which are ſo much the more intereſting, as they furniſh a lively picture of their manners. They initiate them into the myſteries of their art, and teach them to contrive laſcivious dances. Theſe girls, who have a cultivated underſtanding, are very agreeable in converſation. They ſpeak their language with purity. The habit of dedicating themſelves to poetry renders the ſofteſt and moſt ſonorous expreſſions familiar to them. They repeat with a great deal of grace. In ſinging, nature is their only guide. Sometimes two of them ſing together, but always with the ſame voice. It is the ſame with an orcheſtra, where all the inſtruments playing in uniſon execute the ſame part.

The Almé aſſiſt at the marriage ceremonies, and march before the bride, playing on inſtruments. They make a figure likewiſe at funerals, and accompany the proceſſion, ſinging ſorrowful airs. They break forth into groans and lamentations, and give every ſign of grief and deſpair. Theſe women are paid very high, and ſeldom appear but amongſt the grandees and rich men.

The common people have alſo their Almé. They are girls of the ſecond claſs, who try to imitate the former; but they have neither their elegance, their graces, nor their knowledge. They are every where to be met with. The public places and the walks about Grand Cairo are full of them. As the populace require alluſions ſtill more ſtrongly marked, decency will not permit the relation to what a pitch they carry the licentiouſneſs of their geſtures and attitudes.

ALMEDIA, a frontier-town of Portugal, in the province of Tralos Montes, on the confines of Leon, where there was a very briſk action between the French and Portugueſe in 1663; 17 miles N. W. of Cividad Rodrigo. W. Long. 7. 10. N. Lat. 40. 41.

ALMEHRAB, in the Mahometan cuſtoms, a nich in their moſques, pointing towards the kebla or temple of Mecca, to which they are obliged to bow in praying. See Kebla.

ALMEISAR, a celebrated game among the ancient Arabs, performed by a kind of caſting of lots with arrows, ſtrictly forbid by the law of Mahomet, on account of the frequent quarrels occaſioned by it.

The manner of the game was thus: A young camel being brought and killed, was divided into a number of parts. The adventurers, to the number of ſeven, being met, 11 arrows were provided without heads or feathers; ſeven of which were marked, the firſt with one notch, the ſecond with two, the third with three, &c. the other four had no marks. Theſe arrows were put promiſcuouſly into a bag, and thus drawn by an indifferent perſon. Thoſe to whom the marked arrows fell, won ſhares in proportion to their lot; the reſt to whom the blanks fell, were intitled to no part of the camel, but obliged to pay the whole price of it. Even the winners taſted not of the fleſh themſelves more than the loſers, but the whole was diſtributed to the poor.

ALMENE, in commerce, a weight of two pounds uſed to weigh ſaffron in ſeveral parts of the continent of the E. Indies.

ALMERIA, a ſea-port town in the kingdom of Granada in Spain, pleaſantly ſituated in a fine bay at the mouth of the river Almeria, on the Mediterranean; W. Long. 3. 20. N. Lat. 36. 51. This town is by ſome thought to have riſen upon the ruins of the ancient Abdera, and was formerly a place of great conſequence. It was taken from the Moors in 1147, by the emperor Conrad III. in conjunction with the French, Genoeſe, and Piſans.—It was at that time the ſtrongeſt place in Spain, held by the infidels; from which their privateers, which were exceedingly numerous, not only troubled the ſea-coaſts inhabited by the Chriſtians, but gave equal diſturbance to the maritime provinces of France, Italy, and the adjacent iſlands. The city being well fortified, having a ſtrong caſtle, a numerous garriſon, and being excellently provided with every thing neceſſary, made a vigorous reſiſtance; but was at laſt taken by ſtorm, when the victor put to the ſword all the inhabitants who were found in arms, diſtributing the beſt part of the plunder among his allies,

lies, whom he ſent away thoroughly ſatisfied. The Genoeſe, particularly, acquired here that emerald veſſel which ſtill remains in their treaſury, and is deemed invaluable.

Upon its reduction by the Chriſtians Almeria became a biſhopric; but is at preſent very little better than a village, indifferently inhabited, and has nothing to teſtify ſo much as the probability of its former greatneſs, except certain circumſtances which cannot be effaced even by the indolence of the Spaniards themſelves. What theſe are, Udal ap Rhys, a Welſhman, thus deſcribes, in his tour through Spain and Portugal. "Its climate (ſays he) is ſo peculiarly bleſſed, that one really wants words to expreſs its charms and excellence. Its fields and meads are covered with flowers all the year round; they are adorned alſo with palms, myrtles, plane-trees, oranges, and olives; and the mountains and promontories near it are as noted for their producing a great variety of precious ſtones, inſomuch that the next promontory to it is culled the *Cape of Gates*, which is a corruption from the word *agates*, the hills thereabouts abounding in that ſort of precious ſtones, as well as in emeralds and amethyſts, granites or coarſe rubies, and extreme curious alabaſter in the mountains of Filaures."

ALMISSA, a ſmall but ſtrong town at the mouth of the Cetina, in Dalmatia, famous for its piracies; ten miles eaſt of Spalatro. E. Long. 39. 33. N. Lat. 43. 56.

ALMOND, the fruit of the almond tree. See AMYGDALUS.

ALMOND, in commerce, a meaſure by which the Portugueſe ſell their oil; 26 almonds make a pipe.

ALMONDS, in anatomy, a name ſometimes given to two glands, generally called the *tonſils*.

ALMONDS, among lapidaries, ſignify pieces of rock-cryſtal, uſed in adorning branch-candleſticks, &c. on account of the reſemblance they bear to the fruit of that name.

ALMOND-Furnace, among refiners, that in which the ſlags of litharge, left in refining ſilver, are reduced to lead again by the help of charcoal.

ALMONDBURY, a village in England, in the weſt-riding of Yorkſhire, ſix miles from Halifax.

ALMONER, in its primitive ſenſe, denotes an officer in religious houſes, to whom belonged the management and diſtribution of the alms of the houſe. By the ancient canons, all monaſteries were to ſpend at leaſt a tenth part of their income in alms to the poor. The almoner of St Paul's is to diſpoſe of the monies left for charity, according to the appointment of the donors, to bury the poor who die in the neighbourhood, and to breed up eight boys to ſinging, for the uſe of the choir. By an ancient canon, all biſhops are required to keep almoners.

Lord ALMONER, or *Lord High ALMONER, of England*, is an eccleſiaſtical officer, generally a biſhop, who has the forfeiture of all deodands, and the goods of *felos de ſe*, which he is to diſtribute among the poor. He has alſo, by virtue of an ancient cuſtom, the power of giving the firſt diſh from the king's table to whatever poor perſon he pleaſes, or, inſtead of it, an alms in money.

Great ALMONER, Grand AUMONIER, in France, is the higheſt eccleſiaſtical dignity in that kingdom. To him belongs the ſuperintendency of all hoſpitals and houſes of lepers. The king receives the ſacrament from his hand; and he ſays maſs before the king in all grand ceremonies and ſolemnities.

ALMONER is alſo a more faſhionable title given by ſome writers to chaplains. In this ſenſe we meet with almoner of a ſhip, almoner of a regiment.

ALMONRY, or AUMBRY, the office or lodgings of the almoner; alſo the place where alms are given. See AUMBRY.

ALMS, a general term for what is given out of charity to the poor.

In the early ages of Chriſtianity, the alms of the charitable were divided into four parts; one of which was allotted to the biſhop, another to the prieſts, and a third to the deacons and ſubdeacons, which made their whole ſubſiſtence; the fourth part was employed in relieving the poor, and in repairing the churches.

No religious ſyſtem is more frequent or warm in its exhortations to alms-giving than the Mahometan. The Alcoran repreſents alms as a neceſſary means to make prayer be heard. Hence that ſaying of one of their khalifs: "Prayer carries us half-way to God, faſting brings us to the door of his palace, and alms introduces us into the preſence-chamber." Hence many illuſtrious examples of this virtue among the Mahometans. Haſan, the ſon of Ali, and grandſon of Mohammed, in particular, is related to have thrice in his life divided his ſubſtance equally between himſelf and the poor, and twice to have given away all he had. And the generality are ſo addicted to the doing of good, that they extend their charity even to brutes.

ALMS, alſo denotes lands or other effects left to churches or religious houſes, on condition of praying for the ſoul of the donor. Hence,

Free ALMS was that which is liable to no rent or ſervice.

Reaſonable ALMS was a certain portion of the eſtates of inteſtate perſons, allotted to the poor.

ALMS Box or *Cheſt*, a ſmall cheſt, or coffer, called by the Greeks Κιβατιον, wherein anciently the alms were collected, both at church and at private houſes.

The alms-cheſt in Engliſh churches, is a ſtrong box, with a hole in the upper part, having three keys, one to be kept by the parſon or curate, the other two by the church-wardens. The erecting of ſuch alms-cheſt in every church is enjoined by the book of canons, as alſo the manner of diſtributing what is thus collected among the poor of the pariſh.

ALMS-Houſe, a pretty kind of hoſpital, for the maintenance of a certain number of poor, aged, or diſabled people.

ALMUCANTARS, in aſtronomy, an Arabic word denoting circles of the ſphere paſſing through the centre of the ſun, or a ſtar, parallel to the horizon, being the ſame as *PARALLELS of Altitude*.

ALMUCANTARS-Staff, is an inſtrument uſually made of pear-tree or box, having an arch of 15 degrees; uſed to take obſervations of the ſun, about the time of its riſing and ſetting; in order to find the amplitude, and conſequently the variation of the compaſs.

ALMUCIUM, denotes a kind of cover for the head, worn chiefly by monks and eccleſiaſtics: It was of a ſquare form, aud ſeems to have given riſe to the bonnets of the ſame ſhape ſtill retained in univerſities and cathedrals.

ALMUGIM, or ALMUG-TREE, a certain kind of wood mentioned in the firſt book of Kings, (x. 11.) which the vulgate tranſlates *ligna thyina*, and the Septuagint *wrought wood*. The rabbins generally render it *coral*; others, *ebony*, *bravil*, or *pine*. But it is obſerved, that the almug-tree can by no means be coral, becauſe that wood is not fit for the purpoſes that the Scripture tells us the almug-tree was uſed, ſuch as muſical inſtruments, ſtair-caſes, &c. The word *thyinum* is a name for the citron-tree, known to the ancients, and very much eſteemed for its ſweet odour and great beauty. It came from Mauritania. The almug-tree, or almugim, algumim, or ſimply gummim, taking *al* for a kind of article, is therefore by the beſt commentators underſtood to be an oily and gummy ſort of wood; and particularly that ſort of tree which produces the gum ammoniac, which is alſo thought to be the ſame with the ſhittim-wood, whereof there is ſuch frequent mention made by Moſes.

ALMUNECAR, a ſea-port town in the kingdom of Granada, ſeated on the Mediterranean, with a good harbour, defended by a ſtrong caſtle, 20 miles ſouth of Alhama. W. Long. 3. 45. N. Lat. 36. 50.

ALNAGE, or AULNAGE, the meaſuring of woollen manufactures with an ell. It was at firſt intended as a proof of the goodneſs of that commodity, and accordingly a ſeal was invented as a mark that the commodity was made according to the ſtatute; but, it being now poſſible to purchaſe theſe ſeals, they are affixed whenever the vender pleaſes, to all cloths indiſcriminately, to the great prejudice of the Britiſh woollen manufactures.

ALNAGER, ALNEGER, or AULNEGER, q. d. *meaſurer by the ell*; ſignifies a ſworn public officer, who by himſelf, or deputy, is to look to the aſſize of woollen cloth made throughout the land, i. e. the length, width, and work thereof; and to the ſeals for that purpoſe ordained. The office of king's aulnager ſeems to have been derived from the ſtatute of Richard I. A. D. 1197, which ordained, that there ſhould be only one weight and one meaſure throughout the kingdom; and that the cuſtody of the aſſize, or ſtandard of weights and meaſures, ſhould be committed to certain perſons in every city and borough. His buſineſs was, for a certain fee, to meaſure all the cloth made for ſale, till the office was aboliſhed by the ſtatute 11 and 12 W. III. chap. 20.

ALNUS, the ALDER-TREE, a ſpecies of betula. See BETULA.

ALNUS, in the ancient theatres, that part which was moſt diſtant from the ſtage.

ALNWICK, a thoroughfare town in Northumberland, on the road to Scotland. Here Malcolm, king of Scotland, making an inroad into Northumberland was killed, with Edward his ſon, and his army defeated by Robert Mowbray, earl of this county, *anno* 1092. Likewiſe William, king of Scotland, in 1174, invading England with an army of 80,000 men, was here enconntered, his army routed, and himſelf made priſoner. The town is populous, and in general well built; it has a large town-houſe, where the quarter-ſeſſions and county-courts are held, and members of parliament elected. It has a ſpacious ſquare, in which a market is held every Saturday. Alnwick appears to have been formerly fortified, by the veſtiges of a wall ſtill viſible in many parts, and three gates which remain almoſt entire. It is governed by four chamberlains, who are choſen once in two years out of a common council, conſiſting of 24 members. It is ornamented by a ſtately old Gothic caſtle, which has been the ſeat of the noble family of Piercy, earls of Northumberland. As the audits for receipt of rents have ever been in this caſtle, it has always been kept in tolerable repair; and not many years ago, it was repaired and beautified by the duke of Northumberland, who made very conſiderable alterations, upon a moſt elegant plan, with a view to reſide in it ſome part of the ſummer ſeaſon. The manner of making freemen is peculiar to this place, and indeed is as ridiculous as ſingular. The perſons who are to be made free, or, as the phraſe is, leap the well, aſſemble in the market-place, very early in the morning, on the 25th of April, being St Mark's day. They appear on horſe-back, with every man his ſword by his ſide, dreſſed in white, and with white night-caps, attended by the four chamberlains and the caſtle-bailiff, mounted and armed in the ſame manner; from hence they proceed, with muſic playing before them, to a large dirty pool, called *Freeman's-well*, where they diſmount, and draw up in a body, at ſome diſtance from the water; and then ruſh into it all at once, and ſcramble through the mud as faſt as they can. As the water is generally very foul, they come out in a dirty condition; but taking a dram, they put on dry clothes, remount their horſes, and ride full gallop round the confines of the diſtrict; then re-enter the town, ſword in hand, and are met by women dreſſed in ribbons with bells and garlands, dancing and ſinging. Theſe are called *timber-waſtes*. The houſes of the new freemen are on this day diſtinguiſhed by a great holly-buſh, as a ſignal for their friends to aſſemble and make merry with them after their return. This ceremony was owing to king John, who was mired in this well; and who, as a puniſhment for not mending the road, made this a part of their charter. Alnwick is 310 miles north by weſt from London, 33 north of Newcaſtle, and 29 ſouth of Berwick. W. Long. 1. 10. Lat. 55. 24.

ALOA, in Grecian antiquity, a feſtival kept in honour of Ceres by the huſbandmen, and ſuppoſed to reſemble our harveſt-home.

ALOE, in botany, a genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method, ranking under the 10th order, *Coronariæ*. The characters are: There is no *calyx*: The *corolla* is monopetalous, erect, ſix-cleft, and oblong; the tube gibbous; the border ſpreading, and ſmall; with a nectary-bearing bottom: The *ſtamina* conſiſt of ſix ſubulated filaments, rather ſurpaſſing the corolla in length, and inſerted into the receptacles; the antheræ are oblong and incumbent: The *piſtillum* has an ovate germen; the ſtylus is ſimple, the length of the ſtamina; the ſtigma is obtuſe and trifid: The *pericarpium* is an oblong capſule, three furrowed, three-celled, three-valved: The *ſeeds* are many and angular. Of this genus, botanical writers enumerate ten ſpecies; of which the moſt remarkable are,

1. The diſticha, by ſome called the *ſoap aloe*, by

others *caballine aloe*. This ſeldom riſes above two feet high. The leaves are very broad at the baſe, where they cloſely embrace the ſtalk, and gradually decreaſe to a point. The edges are ſet with ſharp ſpines, and the under leaves ſpread open horizontally every way. Theſe are of a dark green colour ſpotted with white, ſomewhat reſembling the colour of ſoft ſoap, from whence the plant got the name of *ſoap-aloe*. The flowers grow in umbels on the tops of the ſtalks, are of a beautiful red colour, and appear in Auguſt and September. 2. The variegate, or partridge-breaſt aloe, is a low plant, ſeldom riſing above eight inches high. The leaves of this are triangular, and curiouſly veined and ſpotted, ſomewhat like the feathers of a partridge's breaſt. The flowers grow in very looſe ſpikes, and are of a fine red colour tipped with green. 3. The viſcoſa, with funnel-ſhaped flowers, grows near a foot high, with triangular leaves of a dark green colour. The flowers grow thinly upon very ſlender footſtalks, are of a herbaceous colour, and their upper part turns backward. 4. The ſpiralis, with oval crenated flowers, grows ſomewhat like the former, only the flowers grow upon taller ſtalks, which branch out and grow in very long cloſe ſpikes. 5. The linguisformæ, or tongue-aloe, has its leaves about ſix inches in length, and ſhaped like a tongue. The flowers grow in ſlender looſe ſpikes, each hanging downward, of a red colour below, and green at the top. 6. The margaritifera, or pearl aloe, is a very beautiful plant. It is ſmaller than moſt of the aloe kind. The leaves are ſhort, very thick, ſharp pointed, and turning down, with a large thick end, appear there triangular. The colour of the leaves is a fine green, ſtriped in an elegant manner with white, and frequently tipped with red at the point. The flower-ſtalk, which riſes in the midſt of the leaves, is round, ſmooth, of a purple colour, and generally about eight inches high. When the plant has been properly cultivated, the flowers are ſtriped with green and white; and ſometimes they are entirely white. This aloe is ſingular in not having the bitter reſinous juices with which the leaves of moſt others abound; when a leaf of this ſpecies is cut, what runs from it is watery, colourleſs, and perfectly inſipid. 7. The perfoliata, or ſocotorine aloe, hath long, narrow, ſucculent leaves, which come out without any order, and form large heads. The ſtalk grows three or four feet high; and has two, three, and ſometimes four, of theſe heads branching out from it. The flowers grow in long ſpikes, each ſtanding on a pretty long footſtalk; they are of a bright red colour tipped with green, and generally appear in the winter ſeaſon. 8. The retuſa, or cuſhion aloe, hath very ſhort, thick, ſucculent leaves, compreſſed on the upper ſide like a cuſhion. This grows very cloſe to the ground; the flowers grow on ſlender ſtalks, and are of an herbaceous colour.

Culture. The proper earth for planting theſe vegetables in, is, one half freſh light earth from a common, and the reſt an equal mixture of white ſea-ſand and ſifted lime-rubbiſh. This mixture ſhould be always made ſix or eight months before the plants are to be ſet in it. The common aloe will live in a dry green-houſe in winter; and may be placed in the open air in ſummer, in a ſheltered ſituation, but muſt have very little water. Moſt of the other aloes are beſt preſerved in an airy glaſs-caſe, in which there is a ſtove, to make a little fire in very bad weather. The tendereſt kinds require a greater ſhare of heat to preſerve them in winter, and ſhould be kept in a good ſtove, in a degree of heat ten degrees above temperate. Many other kinds may alſo be kept in this heat; but the gteater the heat, the more water they always require. About the beginning of June, it is uſual in England to ſet the pots of aloes out of the houſe: but they ſhould be ſet under the ſhelter of hedges or trees, to keep them from the violence of the ſun; the rains alſo, which uſually fall in this and the following month, are apt to rot them. It is therefore beſt to keep them under cover the greateſt part of the year. The beſt time to ſhift theſe plants is the middle of July. They are, on this occaſion, to be taken out of the pots, the looſe earth to be picked from about their roots, and the decayed or mouldy parts of them cut off; then a few ſtones are to be put at the bottom of the pot, and it is to be filled with the compoſition before deſcribed, and the plants carefully put in, the roots being ſo diſpoſed as not to interfere with one another. They are to be carefully watered after this, at times, for three weeks, and ſet in a ſhady place. The common kind will bear the open air from May till October, and ſhould be ſhifted every year. All the aloes are propagated by off-ſets, or by planting the leaves. The off-ſets ſhould be taken from the mother plant, at the time when it is ſhifted: they are to be planted in very ſmall pots of the proper mixed earth; and if that part of them which joined to the mother plant be obſerved to be moiſt when taken off, it ſhould lie on the ground in a ſhady place two or three days before it is planted, otherwiſe it will rot. After planting theſe, they ſhould remain in a ſhady place a fortnight; and then be removed to a very moderate hot-bed, plunging the pots therein, which will help their ſtriking new roots. Towards the end of Auguſt they muſt be, by degrees, hardened to the open air, by taking off the glaſſes of the hot-bed; and in September they may be removed into the green-houſe.

Properties, &c. The *aloe* is a kind of ſymbolic plant to the Mahometans, eſpecially in Egypt, and in ſome meaſure dedicated to the offices of religion; for whoever returns from a pilgrimage to Mecca, hangs it over his ſtreet-door, as a token of his having performed that holy journey. The ſuperſtitious Egyptians believe that this plant hinders evil ſpirits and apparitions from entering the houſe; and on this account, whoever walks the ſtreets in Cairo, will find it over the doors both of Chriſtians and Jews. From the ſame plant the Egyptians diſtil a water, which is ſold in the apothecaries ſhops at Cairo, and recommended in coughs, hyſterics, and aſthmas. An unexperienced French ſurgeon, ſays Haſſelquiſt, gave a Coptite, 40 years old, afflicted with the jaundice, four tea-cups full of the diſtilled water of this ſpecies of aloe, and cured him in four days. This remedy, unknown to our apothecaries, is not difficult to be obtained, as the plant might eaſily be raiſed in the warm ſouthern parts of Europe. The Arabians call it *ſabbara*.

Of the leaves of the Guinea aloe, mentioned by Mr Adanſon in his voyage to Senegal, the negroes make very good ropes, not apt to rot in the water.

Dr Sloane mentions two ſorts of aloe; one of which is uſed for fiſhing-lines, bow-ſtrings, ſtockings, and hammocks; the other has leaves which, like thoſe of the wild-pine and banana, hold rain-water, and thereby afford a very neceſſary refreſhment to travellers in hot countries, where there is generally a ſcarcity of wells and water.

In Mexico, the *maguei*, a ſpecies of aloe, yields almoſt every thing neceſſary to the life of the poor. Beſides making excellent hedges for their fields, its trunk ſerved in place of beams for the roofs of their houſes, and its leaves inſtead of tiles. From thoſe leaves they obtained paper, thread, needles, clothing, ſhoes, and ſtockings, and cordage; and from its copious juice they made wine, honey, ſugar, and vinegar. Of the trunk, and thickeſt part of the leaves, when well baked, they made a very tolerable diſh of food. Laſtly, it was a very powerful medicine in ſeveral diſorders, particularly thoſe of the urine. It is alſo at preſent one of the plants the moſt valued, and moſt profitable to the Spaniards.

The medical ſubſtance known by the name of *aloes* is the inſpiſſated juice of ſome of the abovementioned ſpecies. The ancients diſtinguiſhed two ſorts of aloes; the one was pure and of a yellowiſh colour, inclining to red, reſembling the colour of a liver, and thence named *hepatic;* the other was full of impurities, and hence ſuppoſed to be only the droſs of the better kind. At preſent, various ſorts are met with in the ſhops; which are diſtinguiſhed either from the places, from the ſpecies of the plants, or from ſome difference in the juices themſelves. Theſe may be ranged in three claſſes:

1. *ALOE Perfoliata*, ſocotorine aloe, brought from the iſland Socotora in the Indian ocean, wrapt in ſkins; it is obtained from the 5th ſpecies abovementioned.—This ſort is the pureſt of the three: it is of a gloſſy ſurface, clear, and in ſome degree pellucid; in the lump of a yellowiſh red colour, with a purple caſt; when reduced to powder, of a bright golden colour. It is hard and friable in the winter, ſomewhat pliable in ſummer, and grows ſoft betwixt the fingers. Its taſte is bitter, accompanied with an aromatic flavour, but inſufficient to prevent its being diſagreeable; the ſmell is not very unpleaſant, and ſomewhat reſembles that of myrrh.

2. *ALOE Hepatica*, hepatic, Barbadoes, or common aloes (the juice of a variety of the former), is not ſo clear and bright as the foregoing ſort; it is alſo of a darker colour, more compact texture, and for the moſt part drier. Its ſmell is much ſtronger and more diſagreeable; the taſte intenſely bitter and nauſeous, with little or nothing of the fine aromatic flavour of the ſocotorine.—The beſt hepatic aloes come from Barbadoes in large gourd-ſhells; an inferior ſort of it (which is generally ſoft and clammy) is brought over in caſks.

Of the cultivation and preparation of hepatic aloes in the iſland of Barbadoes, we have the following account in the London Medical Journal*. "The lands in the vicinity of the ſea, that is from two to three miles, which are rather ſubject to drought than otherwiſe, and are ſo ſtony and ſhallow as not to admit of the planting of ſugar canes with any proſpect of ſucceſs, are generally found to anſwer beſt for the aloe plant. The ſtones, at leaſt the larger ones, are firſt picked up, and either packed in heaps, upon the moſt ſhallow barren ſpots, or laid round the field as a dry wall. The land is then lightly ploughed, and very carefully cleared of all noxious weeds, lined at one foot diſtance, from row to row, and the young plants ſet, like cabbages, at about five or ſix inches diſtance from each other. This regular mode of lining and ſetting the plants is practiſed only by the moſt exact planters, in order to facilitate the weeding of them by hand, very frequently becauſe, if they are not kept perfectly clean and free from weeds, the produce will be but very ſmall. They will bear being planted in any ſeaſon of the year, even in the drieſt, as they will live on the ſurface of the earth many weeks without a drop of rain. The moſt general time, however, of planting them, is from April to June.

"In the March following, the labourers carry a parcel of tubs and jars into the field, and each takes a ſlip or breadth of it, and begins by laying hold of a bunch of the blades, as much as he can conveniently graſp with one hand, while with the other he cuts it juſt above the ſurface of the earth, as quickly as poſſible, (that the juice may not be waſted), and then places the blades in the tub, bunch by bunch, or handful by handful. When the firſt tub is thus packed quite full, a ſecond is begun (each labourer having two); and by the time the ſecond is filled, all the juice is generally drained out of the blades in the firſt tub. The blades are then lightly taken out, and thrown over the land by way of manure; and the juice is poured out into a jar. The tub is then filled again with blades, and ſo alternately till the labourer has produced his jar full, or about four gallons and an half of juice, which is often done in ſix or ſeven hours, and he has then the remainder of the day to himſelf, it being his employer's intereſt to get each day's operation as quickly done as poſſible.—It may be obſerved, that although aloes are often cut in nine, ten, or twelve months after being planted, they are not in perfection till the ſecond and third year; and that they will be productive for a length of time, ſay 10 or 12 years, or even for a much longer time, if good dung, or manure of any kind, is ſtrewed over the field once in three or four years, or oftener if convenient.

"The aloe juice will keep for ſeveral weeks without injury. It is therefore not boiled till a ſufficient quantity is procured to make it an object for the boiling-houſe. In the large way, three boilers, either of iron or of copper, are placed to one fire, though ſome have but two, and the ſmall planters only one. The boilers are filled with the juice; and, as it ripens or becomes more inſpiſſated, by a conſtant but regular fire, it is ladled forward from boiler to boiler, and freſh juice is added to that fartheſt from the fire, till the juice in that neareſt to the fire (by much the ſmalleſt of the three, and commonly called by the name of *tatch*, as in the manufactory of ſugar) becomes of a proper conſiſtency to be ſkipped or ladled out into gourds, or other ſmall veſſels, uſed for its final reception. The proper time to ſkip or ladle it out of the tatch, is when it is arrived at what is termed a reſin height, or when it cuts freely, or in thin flakes, from the edges of a ſmall wooden ſlice, that is dipped from time to time into the tatch for that purpoſe. A little lime-water is uſed by ſome aloe-boilers, during the proceſs, when the ebullition is too great.

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* Vol. viii. Art. 8.

"As to the ſun-dried aloes (which is moſt approved for medicinal purpoſes), very little is made in Barbadoes. The proceſs is, hower, very ſimple, though extremely tedious The raw juice is either put into bladders, left quite open at top, and ſuſpended in the ſun, or in broad ſhallow trays of wood, pewter, or tin, expoſed alſo to the ſun, every dry day, until all the fluid parts are exhaled, and a perfect reſin formed, which is then packed up for uſe, or for exportation."

The Barbadoes aloe is ſaid to be common alſo in the other Weſt India Iſlands; and the following account of the manner of preparing it in Jamaica is given by Dr Wright in the ſame volume of the Medical Journal, art. 1. "The plant is pulled up by the roots, and carefully cleanſed from the earth or other impurities. It is then ſliced and cut in pieces into ſmall hand-baſkets or nets. Theſe nets or baſkets are put into large iron boilers with water, and boiled for ten minutes, when they are taken out, and freſh parcels ſupplied till the liquor is ſtrong and black. At this period the liquor is thrown through a ſtrainer into a deep vat, narrow at bottom, to cool, and to depoſite its fæculent parts. Next day the clear liquor is drawn off by a cock, and again committed to the large iron veſſel. At firſt it is boiled briſkly; but towards the end of the evaporation is ſlow, and requires conſtantly ſtirring to prevent burning. When it becomes of the conſiſtence of honey, it is poured into gourds or calabaſhes for ſale. This hardens by age."

3. *Aloe-Caballina*, fetid caballine, or horſe-aloe, is ſuppoſed to be a coarſer ſort obtained from the ſame ſpecies with the foregoing: according to others, it is the produce of the diſticha. It is chiefly diſtinguiſhed by its ſtrong rank ſmell.

All the different kinds are gum-reſins, which contain more gummous than reſinous parts. Water, when of a boiling heat, diſſolves all the ſoluble parts of aloes; but if let ſtand till it grows cold, it lets drop moſt of its reſin. A ſtrong ſpirit diſſolves and keeps ſuſpended almoſt the whole of aloes, though it contains ſuch a large portion of gummous parts; hence it is evident, that aloes contain ſome principle, ſaline or other, which renders water capable of diſſolving reſin, and ſpirit capable of diſſolving gum.

Aloe is a ſtimulating ſtomachic purge, which, given in ſmall quantity, operates mildly by ſtool; but in large doſes acts roughly, and often occaſions an irritation about the anus, and ſometimes a diſcharge of blood. It is a good opening medicine to people of a lax habit, or who live a ſedentary life; and to thoſe whoſe ſtomach and bowels are loaded with phlegm or mucus, or who are troubled with worms, or are debilitated; becauſe at the ſame time that it carries off thoſe viſcid humours which pall the appetite, and overload the inteſtines, it ſerves as a ſtrengthener and bracer. In ſmall doſes, repeated from time to time, it not only cleanſes the prima viæ, but likewiſe tends to promote the menſtrual diſcharge in women; and therefore it is frequently employed in chloroſis, or where the menſtrua are obſtructed. It is a good ſtomachic purge, and is given in all ſuch caſes where ſuch a one is wanted; but it is looked upon as a heating medicine, and not proper in bilious habits, or where there is much heat or fever; and its continued uſe is apt to bring on the piles.

It is given in ſubſtance from five grains to a ſcruple, though formerly it uſed to be preſcribed in doſes of two or three times that quantity; but theſe large doſes ſometimes brought on troubleſome ſymptoms. As it is a ſlow working purge, it is generally taken at bedtime, and it operates next day.

With regard to this as well as to all other reſinous purges, it ought to be obſerved, that when they are given in ſubſtance without any mixture, they are apt to adhere to the coats of the inteſtines, and to occaſion griping and uneaſineſs; for theſe reaſons aloes are generally mixed with ſome ſaponaceous or reſolvent body, to deſtroy its viſcid tenacity, before it is given in ſubſtance. The ſubſtances which are moſt uſed for this purpoſe are, a ſmall quantity of the fixed alkaline ſalts; ſoap; the yolk of an egg; and gummous vegetable extracts. Mr Barton alleges*, that by triturating aloes with a ſmall quantity of alkaline ſalts, its tenacity was more effectually deſtroyed than by any other thing he tried: that Caſtile ſoap and the yolk of an egg anſwered beſt, next to it; that manna, ſugar, and honey, were far inferior to them; and that gummous, or mucous vegetable extracts, ſuch as the extracts of gentian, or of liquorice root, triturated with the aloes, in the proportion of one part of the extract to two of the aloes, and then made up in pills with a ſufficient quantity of ſyrup, deſtroyed the viſcidity of the aloes, and rendered its operation mild.

Socotorine aloe contains more gummy matter than the hepatic; and hence it is likewiſe found to purge more, and with greater irritation. The firſt ſort therefore is moſt proper where a ſtimulus is required, as for promoting or exciting the menſtrual flux; whilſt the latter is better calculated to act as a common purge. For the aloetic preparations, ſee Pharmacy. *Index.*

Aloes-Wood. See *Xylo-Aloes.*

American Aloe. See Agave.

ALOGIANS, in church-hiſtory, a ſect of ancient heretics, who denied that Jeſus Chriſt was the Logos, and conſequently rejected the goſpel of St John—the word is compounded of the privative α, and λογος, q. d. *without-Logos* or *Word.*—Some aſcribe the origin of the name, as well as of the ſect of Alogians, to Theodore of Byzantium, by trade a currier; who having apoſtatized under the perſecution of the emperor Severus, to defend himſelf againſt thoſe who reproached him therewith, ſaid that it was not God he denied, but only man. Whence his followers were called in Greek αλογοι, becauſe they rejected the Word. But others, with more probability, ſuppoſe the name to have been firſt given them by Epiphanius in the way of reproach. They made their appearance towards the cloſe of the ſecond century.

ALOGOTROPHIA, among phyſicians, a term ſignifying the unequal growth or nouriſhment of any part of the body, as in the rickets.

ALOOF, has frequently been mentioned as a ſea-term; but whether juſtly or not, we ſhall not preſume to determine. It is known in common diſcourſe to imply *at a diſtance*; and the reſemblance of the phraſes *keep a loof*, and *keep a luff*, or *keep the luff*, in all probability gave riſe to this conjecture. If it was really a ſea-phraſe originally, it ſeems to have referred to the dangers of a lee-ſhore, in which ſituation the pilot might naturally apply it in the ſenſe commonly underſtood, viz. keep *all off*, or quite off: it is, however, never expreſſed in

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* *Treatiſe of the Manufacture of Drugs.* 1747.

that manner by ſeamen now. See Luff. It may not be improper to obſerve, that beſides uſing this phraſe in the ſame ſenſe with us, the French alſo call the weather-ſide of a ſhip, and the weather-clue of a courſe, *le lof*.

ALOPECE, Alopecia (anc. geog.), an iſland placed by Ptolemy at the mouth of the Tanais, and called the iſland *Tanais*: now *l'Iſle des Renards* (Baudrand). Alſo an iſland of the Boſphorus Cimmerius (Pliny); and another in the Egean ſea, over-againſt Smyrna.

ALOPECIA, a term uſed among phyſicians to denote a total falling off of the hair from certain parts, occaſioned either by the defect of nutritious juice, or by its vicious quality corroding the roots of it, and leaving the ſkin rough and colourleſs.

The word is formed from αλωπηξ, *vulpes*, "a fox;" whoſe urine, it is ſaid, will occaſion baldneſs; or becauſe it is a diſeaſe which is common to that creature. It is directed to waſh the head every night at going to bed with a ley prepared by boiling the aſhes of vine branches in red wine. A powder made by reducing hermodactyls to fine flour is alſo recommended for the ſame purpoſe.

In caſes where the baldneſs is total, a quantity of the fineſt burdock roots are to be bruiſed in a marble mortar, and then boiled in white wine until there remains only as much as will cover them. This liquor, carefully ſtrained off, is ſaid to cure baldneſs, by waſhing the head every night with ſome of it warm. A ley made by boiling aſhes of vine branches in common water, is alſo recommended with this intention. A freſh cut onion, rubbed on the part until it be red and itch, is likewiſe ſaid to cure baldneſs.

A multitude of ſuch remedies are every where to be found in the works of Valeſcus de Taranta, Rondeletius, Hollerius, Trincavellius, Celſus, Senertay, and other practical phyſicians. See alſo Buxus.

ALOPECURUS, or Fox-tail grass, in botany: A genus of the triandria digynia claſs; and in the natural method ranking under the 4th order, *Gramina*. The characters are; The *calyx* is a ſingle-flower'd bivalve glume: The *corolla* is one-valved: The *ſtamina* conſiſt of three capillary filaments; the antheræ bifurcated at both ends: The *piſtillum* is a roundiſh germen; there are two ſtyli; and the ſtigmata are ſimple: The *pericarpium* is a corolla cloathing the ſeed; and the *ſeed* is ſingle and roundiſh. There are eight ſpecies, viz. the pratenſis, or meadow fox-tail graſs; the bulboſus, or bulbous fox-tail graſs; the geniculatus, or flote fox-tail graſs; and the myoſuroides, or field fox-tail graſs; theſe four grow wild in Britain: the agreſtis, the monſpelienſis, the paniceus, and the hordeiformis, are all natives of France and the ſouthern parts of Europe, except the laſt, which is a native of India. See Grass.

ALOPEX, in zoology, a ſpecies of the canis, with a ſtrait tail and black tip. It is commonly called the *field fox*.

ALOSA, the ſhad, or mother of herrings, a ſpecies of the clupea. See Clupea.

ALOST, a town in Flanders, belonging to the houſe of Auſtria, ſeated on the river Dender, in the midway between Bruſſels and Ghent. It has but one pariſh; but the church is collegiate, and has a provoſt, a dean, and twelve canons. Here is a convent of Carmelites, another of capuchines, another of bare-footed Carmelites, three nunneries, an hoſpital, and a convent of Guillemins, in which is the tomb of Theodore Martin, who brought the art of printing out of Germany into the Low Countries. He was a friend of Eraſmus, who wrote his epitaph. E. Long. 4. 10. N. Lat. 49. 55.

ALPHA, the name of the firſt letter of the Greek alphabet, anſwering to our *A*.—As a numeral, it ſtands for one, or the firſt of any thing. It is particularly uſed among ancient writers, to denote the chief or firſt man of his claſs or rank. In this ſenſe, the word ſtands contradiſtinguiſhed from *beta* which denotes the ſecond perſon. Plato was called the *Alpha* of the wits: Eratoſthenes, keeper of the Alexandrian library, whom ſome called a Second Plato, is frequently named *Beta*.

Alpha is alſo uſed to denote the beginning of any thing. In which ſenſe it ſtands oppoſed to *omega*, which denotes the end. And theſe two letters were made the ſymbol of Chriſtianity; and accordingly were engraven on the tombs of the ancient Chriſtians, to diſtinguiſh them from thoſe of idolaters. Moralez, a Spaniſh writer, imagined that this cuſtom only commenced ſince the riſe of Arianiſm; and that it was peculiar to the orthodox, who hereby made confeſſion of the eternity of Chriſt: but there are tombs prior to the age of Conſtantine whereon the two letters were found, beſides that the emperor juſt mentioned bore them on his labarum before Arius appeared.

ALPHABET, the natural or cuſtomary ſeries of the ſeveral letters of a language (See Language and Writing). The word is formed from *alpha* and *beta*, the firſt and ſecond letters of the Greek alphabet. The number of letters is different in the alphabets of different languages. The Engliſh alphabet contains 24 letters; to which if we add *j* and *v* conſonant, the ſum will be 26: the French contains 23; the Hebrew, Chaldee, Syriac, and Samaritan, 22 each; the Arabic 28; the Perſian 31; the Turkiſh 33; the Georgian 36; the Coptic 32; the Muſcovite 43; the Greek 24; the Latin 22; the Sclavonic 27; the Dutch 26; the Spaniſh 27; the Italian 20; the Ethiopic and Tartarian, each 202; the Indians of Bengal 21; the Barameſe 19. The Chineſe have, properly ſpeaking, no alphabet, except we call their whole language by that name; their letters are words, or rather hieroglyphics, amounting to about 80,000.

It has been a matter of conſiderable diſpute whether the method of expreſſing our ideas by viſible ſymbols, called *letters*, be really a human invention; or whether we ought to attribute an art ſo exceedingly uſeful, to an immediate revelation from the Deity.—In favour of the latter opinion it has been urged.

1
Arguments for writing being a divine revelation.

1. The five books of Moſes are univerſally acknowledged to be the moſt ancient compoſitions as well as the moſt early ſpecimen of alphabetical writing we have. If, therefore, we ſuppoſe writing to be the reſult of human ingenuity, it muſt be different from all other arts, having been brought to perfection at once; as it ſeems impoſſible to make any real improvement on the Hebrew alphabet. It may indeed be replied, that alphabetical characters perhaps have exiſted many ages before the writings of Moſes, though the more ancient ſpecimens have periſhed. This, however, being a

mere unſupported aſſertion, without any hiſtorical teſtimony to corroborate it, cannot be admitted as a proof. Again, ſetting aſide the evidence to be derived from Scripture on this ſubject, the ſimplicity of manners predominant in the early ages, the ſmall extent of the intellectual powers of mankind, and the little intercourſe which nations had with one another, which would ſeem more particularly to render writing neceſſary, can ſcarce allow us to ſuppoſe that ſuch a complex and curious contrivance as alphabetical writing could be invented by a race of men whoſe wants were ſo few, their advantages ſo circumſcribed, and their ideas ſo limited.

2. If alphabetical writing were a mere human invention, it might be expected that different nations would have fallen upon the ſame expedient independent of each other during the compaſs of ſo many ages. But no ſuch thing has taken place; and the writing of every people on earth may be referred to one common original. If this can be proved, the argument from ſucceſſive derivation, without a ſingle inſtance of independent diſcovery, muſt be allowed to amount to the very higheſt degree of probability in favour of our hypotheſis, which will now reſt on the evidence for or againſt this fact; and which may be ſummed up in the following manner.

Among the European nations we find none who can pretend any right to the diſcovery of letters. All of them derived the art from the Romans, excepting only the Turks, who had it from the Arabians. The Romans never laid claim to the diſcovery; but confeſſed that they derived their knowledge from the Greeks, and the latter owned that they had it from the Phœnicians; who, as well as their coloniſts the Carthaginians, ſpoke a dialect of the Hebrew ſcarcely varying from the original. The Coptic, or Egyptian, reſembles the Greek in moſt of its characters, and is therefore to be referred to the ſame original. The Chaldee, Syriac, and latter Samaritan, are dialects of the Hebrew, without any conſiderable deviation, or many additional words. The Ethiopic differs more from the Hebrew, but leſs than the Arabic; yet theſe languages have all iſſued from the ſame ſtock, as the ſimilarity of their formation, and the numberleſs words common to them, all ſufficiently evince; and the Perſic is very nearly allied to the Arabic. Alterations indeed would naturally be produced, in proportion to the civilization of the ſeveral nations, and their intercourſe with others; which will account for the ſuperior copiouſneſs of ſome above the reſt. It appears then, that all the languages in uſe amongſt men that have been conveyed in alphabetical characters, have been the languages of people connected ultimately or immediately with the Hebrews, who have handed down the earlieſt ſpecimens of writing to poſterity; and we have therefore the greateſt reaſon to believe, that their method of writing, as well as their language, was derived from the ſame ſource.

This propoſition will be farther confirmed from conſidering the ſameneſs of the artificial denominations of the letters in the Oriental Greek, and Latin languages, accompanied alſo by a ſimilar arrangement, as *alpha, beta,* &c. It may ſtill be objected, however, that the characters employed by the ancients to diſcriminate their letters are entirely diſſimilar. Why ſhould not one nation, it may be urged, adopt from the other the mode of expreſſing the art as well as the art itſelf? To what purpoſe did they take the trouble of inventing other characters? To this objection it may be replied, 1. From the inſtance of our own language we know what diverſities may be introduced in this reſpect merely by length of time and an intercourſe with neighbouring nations. And ſuch an effect would be more likely to take place before the art of printing had contributed to eſtabliſh an uniformity of character: For when every work was tranſcribed by the hand, we may eaſily imagine how many variations would ariſe from the fancy of the ſcribe, and the mode of writing ſo conſtantly different in individuals. 2. This diverſity might ſometimes ariſe from vanity. When an individual of another community had become acquainted with this wonderful art, he might endeavour to recommend himſelf as the inventor; and, to avoid detection, might invent other characters. 3. The characters of the alphabet might ſometimes be accommodated as much as poſſible to the ſymbolical marks already in uſe amongſt a particular people. Theſe having acquired a high degree of ſanctity by the uſe of many generations, would not be eaſily ſuperſeded without the aid of ſome ſuch contrivance. 4. This is ſupported by the teſtimony of Herodotus; who informs us, that "thoſe Phœnicians who came with Cadmus introduced many improvements among the Greeks, and alphabetical writing too, not known among them before that period. At firſt they uſed the Phœnician character; but in proceſs of time, as the pronunciation altered, the ſtandard of the letters was alſo changed. The Ionian Greeks inhabited at that time the parts adjacent to Phœnicia: who having received the art of alphabetical writing from the Phœnicians, uſed it, with an alteration of ſome few characters, and confeſſed ingenuouſly, that it was called Phœnician from the introducers of it." He tells us that he had himſelf ſeen the characters of Cadmus in a temple of Iſmenian Apollo at Thebes in Bœotia, engraven upon tripods, and very much reſembling the Ionian characters. 5. The old Samaritan is preciſely the ſame as the Hebrew language: and the Samaritan Pentateuch does not vary by a ſingle letter in twenty words from the Hebrew: but the characters are widely different: for the Jews adopted the Chaldaic letters during their captivity at Babylon, inſtead of the characters of their forefathers.

3. What we know of thoſe nations who have continued for many centuries unconnected with the reſt of the world, ſtrongly militates againſt the hypotheſis of the human invention of alphabetical writing. The experiment has been fairly made upon the ingenuity of mankind for a longer period than that which is ſuppoſed to have produced alphabetical writing by regular gradations; and this experiment determines peremptorily in their favour. The Chineſe, a people famous for their diſcoveries and mechanical turn of genius, have made ſome advances towards the delineation of their ideas by arbitrary ſigns; but have nevertheleſs been unable to accompliſh this exquiſite device; and after ſo long a trial to no purpoſe, we may reaſonably infer, that their mode of writing, which is growing more intricate and voluminous every day, would never terminate in ſo clear, ſo comparatively ſimple,

ſimple an expedient as that of alphabetical characters. The Mexicans, too, had made ſome rude attempts of the ſame kind; but with leſs ſucceſs than the Chineſe. We know alſo that hieroglyphics were in uſe among the Egyptians poſterior to the practice of alphabetical writing by the Jews: but whether the epiſtolography, as it is called, of the former people, which was in vogue during the continuance of the hieroglyphics, might not poſſibly be another name for alphabetical writing, cannot be decided.

4. We ſhall conſider the argument on which the commonly received ſuppoſition entirely depends; that is, the natural gradation through the ſeveral ſpecies of ſymbols acknowledged to have been in uſe with various people, terminating at laſt by an eaſy tranſition, in the detection of alplabetical characters. The ſtrength of this argument will be beſt underſtood from the following repreſentation.

“ 1. The firſt method of embodying ideas would be by drawing a repreſentation of the objects themſelves. The imperfection of this method is very obvious, both on account of its tediousneſs and its inability of going beyond external appearances to the abſtract ideas of the mind.

“ 2. The next method would be ſomewhat more general, and would ſubſtitute two or three principal circumſtances for the whole tranſaction. So two kings, for example, engaging each other with military weapons, might ſerve to convey the idea of a war between the two nations. This abbreviated method would be more expeditious than the former; but what it gained in conciſeneſs would be loſt in perſpicuity. It is a deſcription more compendious indeed, but ſtill a deſcription of outward objects alone, by drawing their reſemblance. To this head may be referred the picture-writing of the Mexicans.

“ 3. The next advance would be to the uſe of ſymbols: the incorporation, as it were, of abſtract and complex ideas in figures more or leſs generalized, in proportion to the improvement of it. Thus, in the earlier ſtages of this device, a circle might ſerve to expreſs the ſun, a ſemicircle the moon; which is only a contraction of the foregoing method. This ſymbol-writing in its advanced ſtate would become more refined, but enigmatical and myſterious in proportion to its refinement. Hence it would become leſs fit for common uſe, and therefore more particularly appropriated to the myſteries of philoſophy and religion. Thus, two feet ſtanding upon water ſerved to expreſs an impoſſibility; a ſerpent denoted the oblique trajectories of the heavenly bodies; and the beetle, on account of ſome ſuppoſed properties of that inſect, ſerved to repreſent the ſun. The Egyptian hieroglyphics were of this kind.

“ 4. This method being ſtill too ſubtile and complicated for common uſe, the only plan to be purſued was a reduction of the firſt ſtage of the preceding method. Thus a dot, inſtead of a circle, might ſtand for the ſun; and a ſimilar abbreviation might be extended to all the ſymbols. On this ſcheme every object and idea would have its appropriated mark; theſe marks therefore would have a multiplicity proportionable to the works of nature and the operations of the mind. This method was likewiſe practiſed by the Egyptians; but has been carried to greater perfection by the Chineſe. The vocabulary of the latter is therefore infinite, or at leaſt capable of being extended to any imaginable length. But if we compare this tedious and awkward contrivance with the aſtoniſhing brevity and perſpicuity of alphabetical writing, we muſt be perſuaded that no two things can be more diſſimilar; and that the tranſition from a ſcheme conſtantly enlarging itſelf, and growing daily more intricate, to the expreſſion of every poſſible idea by the modified arrangement of four-and-twenty marks, is not ſo very eaſy and perceptible as ſome have imagined. Indeed this ſeems ſtill to be rather an expreſſion of things in a manner ſimilar to the ſecond ſtage of ſymbol-writing than the notification of ideas by arbitrary ſigns.”

2
Additional remarks in confirmation of theſe arguments.

To all this we ſhall ſubjoin the following remarks, which ſeem to give additional force to the foregoing reaſoning.

“ 1. Pliny aſſerts the uſe of letters to have been eternal; which ſhows the antiquity of the practice to extend beyond the æra of authentic hiſtory.

“ 2. The cabaliſtical doctors of the Jews maintain, that alphabetical writing was one of the ten things which God created on the evening of the Sabbath.

“ 3. Moſt of the profane authors of antiquity aſcribe the firſt uſe of alphabetical characters to the Egyptians; who, according to ſome, received them from Mercury; and, according to others, from their god Teuth.

“ 4. There is very little reaſon to ſuppoſe that even language itſelf is the effect of human ingenuity and invention.”

3
Anſwers to the above arguments.

Thus we have ſtated the arguments in favour of the revelation of alphabetical writing; which are anſwered, by thoſe who take the contrary ſide, in the following manner.

1. Moſes no where ſays that the alphabet was a new thing in his time; nor does he give the leaſt hint of his being the inventor of it. The firſt mention we find of *writing* is in the 17th chapter of Exodus; where Moſes is commanded to *write in a book;* and which took place before the arrival of the Iſraelites at Sinai. This ſhows that writing did not commence with the delivery of the two tables of the law, as ſome have ſuppoſed. Neither are we to conclude that the invention had taken place only a ſhort time before; for the *writing in a book* is commanded as a thing commonly underſtood, and with which Moſes was well acquainted. It is plain, from the command to engrave the names of the twelve tribes of Iſrael upon ſtones *like the engravings of a ſignet*, that writing had been known and practiſed among them, as well as other nations, long before. We muſt alſo remember, that the people were commanded to write the law on their door-poſts, &c. ſo that the art ſeems not only to have been known, but univerſally practiſed among them. But had writing been a new diſcovery in the time of Moſes, he would probably have commemorated it as well as the other inventions of muſic, &c.: Nor is there any reaſon to ſuppoſe that God was the immediate revealer of the art; for Moſes would never have omitted to record a circumſtance of ſuch importance, as the memory of it would have been one of the ſtrongeſt barriers againſt idolatry.

Again, though ſeveral profane writers attribute the origin of letters to the gods, or to ſome divine perſon, yet this is no proof of its being actually revealed; but only that the original inventor was unknown. The learned biſhop of Glouceſter obſerves, that the ancients gave nothing to the gods of whoſe original they had any records; but where the memory of the invention was loſt, as of ſeed-corn, wine, writing, civil ſociety, &c. the gods ſeized the property, by that kind of right which gives ſtrays to the lord of the manor.

As neither the ſacred nor profane hiſtorians, therefore, have determined any thing concerning the invention of letters, we are at liberty to form what conjectures we think moſt plauſible concerning the origin of them; and this, it is thought, might have taken place in the following manner.

“ 1. Men, in their rude uncultivated ſtate, would have neither leiſure, inclination, nor inducement, to cultivate the powers of the mind to a degree ſufficient for the formation of an alphabet: but when a people arrived at ſuch a pitch of civilization as required them to repreſent the conceptions of the mind which have no corporeal forms, neceſſity would occaſion further exertions, and urge them to find out a more expeditious manner of tranſacting their buſineſs than by picture-writing.

“ 2. Theſe exertions would take place whenever a nation began to improve in arts, manufactures, and commerce; and the greater genius ſuch a nation had, the more improvements would be made in the notation of their language; whilſt thoſe people who had made leſs progreſs in civilization and ſcience, would have a leſs perfect ſyſtem of elementary characters; and perhaps advance no farther for many ages than the marks or characters of the Chineſe. Hence we may ſee, that the buſineſs of princes, as well as the manufactures and commerce of each country, would produce the neceſſity of deviſing ſome expeditious manner of communicating information to one another.”

The art of writing, however, is of ſo great antiquity, and the early hiſtory of moſt nations ſo full of fable, that it muſt be extremely difficult to determine what nation or people may juſtly claim the honour of the invention. But as it is probable that letters were the produce of a certain degree of civilization among mankind, we muſt therefore have recourſe to the hiſtory of thoſe nations who ſeem to have been firſt civilized.

4
Claim of the Egyptians to the invention of letters.

The Egyptians have an undoubted title to a very early civilization; and many learned men have attributed the invention of letters to them. The late biſhop of Glouceſter contends, that Egypt was the parent of all the learning of Greece, and was reſorted to by all the Grecian legiſlators, naturaliſts, and philoſophers; and endeavours to prove that it was one of the firſt civilized countries on the globe. Their writing was of four kinds: 1. *Hieroglyphic:* 2. *Symbolic;* 3. *Epiſtolic;* and, 4. *Hierogrammatic.* In the moſt early ages they wrote like all other infant nations, by pictures; of which ſome traces yet remain amongſt the hieroglyphics of Horapollo, who informs us, that they repreſented a *fuller* by a man's two feet in water; *fire*, by ſmoke aſcending, &c. But to render this rude invention leſs incommodious, they ſoon deviſed the method of putting one thing of ſimilar qualities for another. The former was called the *curiologic*, the latter the *tropical* hieroglyphic; which laſt was a gradual improvement of the former. Theſe alterations in the manner of delineating hieroglyphic figures produced and perfected another character, called the *running-hand of the hieroglyphics*, reſembling the Chineſe writing; which having been firſt formed by the outlines of each figure, became at length a kind of *marks*; the natural effects of which were, that the conſtant uſe of them would take off the attention from the ſymbol and fix it on the thing ſignified. Thus the ſtudy of ſymbolic writing would be much abbreviated; becauſe the writer or decypherer would then have little to do but to remember the power of the ſymbolic mark; whereas before, the properties of the thing or animal delineated were to be learned. This, together with the other marks by inſtitution, to denote mental conceptions, would reduce the characters to a ſimilar ſtate with the preſent Chineſe; and theſe were properly what the ancients called *hieroglyphical*. We are informed by Dr Robert Huntingdon, in his account of the Porphyry pillars, that there are ſome ancient monuments of this kind yet remaining in Egypt.

The ſacred book or ritual of the Egyptians, according to Apuleius, was written partly in ſymbolic and partly in theſe hieroglyphic characters, in the following manner: “He (the hierophant) drew out certain books from the ſecret repoſitories of the ſanctuary, written in unknown characters, which contained the words of the ſacred formula compendiouſly expreſſed, partly by figures of animals, and partly by certain marks or notes intricately knotted, revolving in the manner of a wheel, crowded together, and curled inward like the tendrils of a vine, ſo as to hide the meaning from the curioſity of the profane.”

5
Letters no
invented i
Egypt.

But though letters were of great antiquity in Egypt, there is reaſon to believe that they were not firſt invented in that country. Mr Jackſon, in his Chronological Antiquities, has endeavoured to prove, that they were not invented or carried into Egypt by *Taaut* or *Thoth*, the firſt Hermes, and ſon of Miſraim, who lived about 500 years after the deluge; but that they were introduced into that country by the ſecond Hermes, who lived about 400 years after the former. This ſecond Hermes, according to Diodorus, was the inventor of grammar and muſic, and added many words to the Egyptian language. According to the ſame author alſo, he invented letters, rythm, and the harmony of ſounds. This was the Hermes ſo much celebrated by the Greeks, who knew no other than himſelf. On the other hand, Mr Wiſe aſſerts that Moſes and Cadmus could not learn the alphabet in Egypt; and that the Egyptians had no alphabet in their time. He adduces ſeveral reaſons to prove that they had none till they received what is called the *Coptic*, which was introduced either in the time of the Ptolemies or under Pſammitichus or Amaſis; and the oldeſt alphabetic letters which can be produced as Egyptian, appear plainly to have been derived from the Greek. Herodotus confeſſes, that all he relates before the reign of Pſammitichus is uncertain; and that he reports the early tranſactions of that nation on the credit of the Egyptian prieſts, on which he did not greatly depend; and Diodorus Siculus is ſaid to have been greatly impoſed upon by them. Manetho, the oldeſt Egyptian hiſtorian, tranſlated the ſacred regiſters out of Egyptian into Greek, which are ſaid by Syncellus to have been written in the ſacred letters, and to have been laid up by the ſecond Mercury in the Egyptian temples. He allows the Egyptian gods to have been mortal men: but his hiſtory was very much corrupted by the Greeks, and hath been called in queſtion by ſeveral writers from the account which he himſelf gave of it. After Cambyſes had carried away the Egyptian records, the prieſts, to ſupply their loſs, and to keep up their pretenſions to antiquity, began to write new records; wherein they not only unavoidably made great miſtakes, but added much of their own invention, eſpecially as to diſtant times.

6 Claim of the Phœnicians.

The Phœnicians have likewiſe been ſuppoſed the inventors of letters; and we have the ſtrongeſt proofs of the early civilization of this people. Their moſt ancient hiſtorian, Sanchoniatho, lived in the time of Abibalus, father of Hiram king of Tyre. He informs us, that letters were invented by *Taaut*, who lived in Phœnicia in the 12th and 13th generations after the creation. "Miſor (ſays he) was the ſon of Hamyn; the ſon of Miſor was *Taaut*, who invented the firſt letters for writing." The Egyptians call him *Thoth*; the Alexandrians *Thoyth*; and the Greeks *Hermes*, or *Mercury*. In the time of this Taaut, or Mercury, (the grandſon of Ham the ſon of Noah), Phœnicia and the adjacent country was governed by Uranus, and after him by his ſon Saturn or Cronus. He invented letters either in the reign of Uranus or Cronus; and ſtaid in Phœnicia with Cronus till the 32d year of his reign. Cronus, after the death of his father Uranus, made ſeveral ſettlements of his family, and travelled into other parts; and when he came to the ſouth country, he gave all Egypt to the god Taautus, that it ſhould be his kingdom. Sanchoniatho began his hiſtory with the creation, and ended it with placing Taautus on the throne of Egypt. He does not mention the deluge, but makes two more generations in Cain's line from Protagonus to Agrovenus (or from Adam to Noah) than Moſes. As Sanchoniatho has not told us whether Taaut invented letters either in the reign of Uranus or Cronus, "we cannot err much (ſays Mr Jackſon) if we place his invention of them 550 years after the flood, or 20 years after the diſperſion, and 2619 years before the Chriſtian æra, and ſix, or perhaps ten, years before he went into Egypt." This prince and his poſterity reigned at Thebes in Upper Egypt for 15 generations.

Several Roman authors attribute the invention of letters to the Phœnicians. Pliny ſays (A), the Phœnicians were famed for the invention of letters, as well as for aſtronomical obſervations and novel and martial arts. Curtius informs us, that the Tyrian nation are related to be the firſt who either taught or learned letters; and Lucan ſays, that they were the firſt who attempted to expreſs ſounds or words by letters. Euſebius alſo tells us from Porphyry, that "Sanchoniatho ſtudied with great application the writings of Taaut, knowing that he was the firſt who invented letters."

The Greeks, as we have already obſerved, knew no older Hermes than the ſecond, who lived about 400 years after the Mezrite Taaut or Hermes. This ſecond Hermes is called by Plato *Theuth*, and counſellor or ſacred ſcribe to king Thanius; but it is not ſaid that he ever reigned in Egypt: but the former Taaut, or Athothes, as Manetho calls him, was the immediate ſucceſſor of Menes the firſt king of Egypt. This ſecond Mercury, if we may believe Manetho, compoſed ſeveral books of the Egyptian hiſtory; and having improved both the language and letters of that nation, the Egyptians attributed the arts and inventions of the former to the latter. The Phœnician language is generally allowed to have been a dialect of the Hebrew; and tho' their alphabet does not entirely agree with the Samaritan, yet there is a great ſimilarity between them. Aſtronomy and arithmetic were much cultivated among them in the moſt early ages; their fine linen, purple, and glaſs, were much ſuperior to thoſe of other nations; and their extraordinary ſkill in architecture and other arts was ſuch, that whatever was great, elegant, or pleaſing, whether in building, apparel, or toys, was diſtinguiſhed by the epithet of Tyrian or Sidonian; theſe being the chief cities of Phœnicia. Their great proficiency in learning and arts of all kinds, together with their engroſſing all the commerce of the weſtern world, are likewiſe thought to give them a juſt claim to the invention of letters.

7 Of the Chaldeans.

The Chaldeans alſo have laid claim to the invention of letters; and with regard to this, there is a tradition among the Jews, Indians, and Arabians, that the Egyptians derived their knowledge from Abraham, who was a Chaldean. This tradition is in ſome degree confirmed by moſt of the weſtern writers, who aſcribe the inventions of arithmetic and aſtronomy to the Chaldeans. Joſephus poſitively aſſerts, that the Egyptians were ignorant of the ſciences of arithmetic and aſtronomy before they were inſtructed by Abraham; and Sir Iſaac Newton admits, that letters were known in the line of that patriarch for many centuries before Moſes. The Chaldaic letters appear to have been derived from the Hebrew or Samaritan; which are the ſame, or nearly ſo, with the old Phœnician. Ezra is ſuppoſed to have exchanged the old Hebrew characters for the more beautiful and commodious Chaldee, which are ſtill in uſe. Beroſus, the moſt ancient Chaldean hiſtorian, who was born in the minority of Alexander the Great, does not ſay that he believed his countrymen to have been the inventors of letters.

8 Of the Syrians.

The Syrians have alſo laid claim to the invention of letters. It is certain, indeed, that they yielded to no nation in knowledge and ſkill in the fine arts. Their language is ſaid to have been the vernacular of all the oriental tongues, and was divided into three dialects. 1. The Aramean, uſed in Meſopotamia, and by the inhabitants of Roha and Edeſſa of Harram, and the Outer Syria. 2. The dialect of Paleſtine; ſpoken by the inhabitants of Damaſcus, Mount Libanus, and the Inner Syria. 3. The Chaldee or Nabathean dialect, the moſt unpoliſhed of the three; and ſpoken in the mountainous parts of Aſſyria, and the villages of

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(A) See above, nº 2. where he ſays that the knowledge of letters was eternal. What dependence can we put in the teſtimony of ſuch a writer?

Irac or Babylonia. It has been generally believed, that no nation of equal antiquity had a more conſiderable trade than the Syrians: they are ſuppoſed to have firſt brought the commodities of Perſia and India into the weſt of Aſia; and they ſeem to have carried on an inland trade by engroſſing the navigation of the Euphrates, whilſt the Phœnicians traded to the moſt diſtant countries. Notwithſtanding theſe circumſtances, however, which might ſeem to favour the claim of the Syrians, the oldeſt characters they have are but about three centuries before Chriſt. Their letters are of two ſorts. 1. The Eſtrangelo, which is the more ancient; and, 2. The Fſhito, the ſimple or common character, which is the more expeditious and beautiful.

9
Of the Indians.

We muſt next examine the claims of the Indians, whoſe pretenſions to antiquity yield to no other nation on earth. Mr Halhed, who has written a grammar of the Shanſcrit language, informs us, that it is not only the grand ſource of Indian literature, but the parent of almoſt every dialect from the Perſian gulph to the Chineſe ſeas, and which is ſaid to be a language of the moſt venerable antiquity. At preſent it is appropriated to the religious records of the Bramins, and therefore ſhut up in their libraries; but formerly it appears to have been current over the greateſt part of the eaſtern world, as traces of its extent may be found in almoſt every diſtrict of Aſia.

Mr Halhed informs us, that "there is a great ſimilarity between the Shanſcrit words and thoſe of the Perſian and Arabic, and even of Latin and Greek; and theſe not in technical or metaphorical terms, but in the main ground-works of language; in monoſyllables, the names of numbers, and the appellations of ſuch things as would be firſt diſcriminated on the immediate dawn of civilization. The reſemblance which may be ſeen of the characters on medals and ſignets of different parts of Aſia, the light they reciprocally throw upon one another, and the general analogy which they all bear to the grand prototype, affords another ample field for curioſity. The coins of Aſſam, Napaul, Caſhmiria, and many other kingdoms, are all ſtamped with Shanſcrit letters, and moſtly contain alluſions to the old Shanſcrit mythology. The ſame conformity may be obſerved in the impreſſions of ſeals from Bootan and Thibet."

The country between the Indus and the Ganges ſtill preſerves the Shanſcrit language in its original purity, and offers a great number of books to the peruſal of the curious; many of which have been handed down from the earlieſt periods of human tradition.

There are ſeven different ſorts of Indian hand-writings, all compriſed under the general term of *Naagoree*, which may be interpreted *writing*. The Bramins ſay that letters were of divine original; and the elegant Shanſcrit is ſtyled *Daeb-naagoree*, or the writings of the Immortals, which might not improbably be a refinement from the more ſimple *Naagoree* of former ages. The Bengal letters are another branch of the ſame ſtock. The Bramins of Bengal have all their Shanſcrit books copied in their national alphabet, and they tranſcribe into them all the Daeb-naagoree manuſcripts for their own peruſal. The Mooriſh dialect is that ſpecies of Hindoſtanic which we owe to the conqueſts of the Mahometans.

The Shanſcrit language contains about 700 radical words; the fundamental part being divided into three claſſes, viz. *Dhaat*, or roots of verbs; 2. *Shubd*, or original nouns; 3. *Evya*, or particles. Their alphabet contains 50 letters, viz. 34 conſonants and 16 vowels. They aſſert that they were in poſſeſſion of letters before any other nation in the world; and Mr Halhed conjectures, that the long-boaſted original civilization of the Egyptians may ſtill be a matter of diſpute. The Rajah of Kiſhinagur affirms, that he has in his poſſeſſion Shanſcrit books, where the Egyptians are conſtantly deſcribed as diſciples, not as inſtructors; and as ſeeking in Indoſtan that liberal education, and thoſe ſciences, which none of their own countrymen had ſufficient knowledge to impart. Mr Halhed hints alſo, that the learning of Hindoſtan might have been tranſplanted into Egypt, and thus have become familiar to Moſes. Several authors, however, are of opinion, that the ancient Egyptians poſſeſſed themſelves of the trade of the Eaſt by the Red Sea, and that they carried on a conſiderable traffic with the Indian nations before the time of Seſoſtris; whom they ſuppoſe to have been cotemporary with Abraham, though Sir Iſaac Newton conjectures him to have been the Shiſhak who took Jeruſalem in the time of Rehoboam.

In the year 1769, one of the ſacred books of the Gentoos, called *Bagavadam*, tranſlated by Meridas Poule, a learned man of Indian origin, and chief interpreter to the ſupreme council of Pondicherry, was ſent by him to M. Bertin in France. In his preface he ſays, that it was compoſed by Viaſſar the ſon of Brahma, and is of ſacred authority among the worſhippers of Viſchnow. This book claims an antiquity of 5000 years; but M. de Guines has ſhown, that its pretenſions to ſuch extravagant antiquity are entirely inconcluſive and unſatisfactory: whence we may conclude, ſays Mr. Aſtle, that though a farther inquiry into the literature of the Indian nations may be laudable, yet we muſt by no means give too eaſy credit to their relations concerning the high antiquity of their manuſcripts and early civilization.

10
Letters not invented in Perſia;

It is not pretended that the Perſians had any great learning among them till the time of Hyſtaſpes the father of Darius. The former, we are told, travelled into India, and was inſtructed by the Bramins in the ſciences for which they were famed at that time. The ancient Perſians deſpiſed riches and commerce, nor had they any money among them till after the conqueſt of Lydia. It appears by ſeveral inſcriptions taken from the ruins of the palace of Perſepolis, which was built near 700 years before the Chriſtian æra, that the Perſians ſometimes wrote in perpendicular columns like the Chineſe. This mode of writing was firſt made uſe of on the ſtems of trees, pillars, or obeliſks. As for thoſe ſimple characters found on the weſt ſide of the ſtair-caſe of Perſepolis, ſome have ſuppoſed them to be alphabetic, ſome hieroglyphic, and others antediluvian. Dr Hyde pronounces them to have been mere whimſical ornaments, though the author of Conjectural Obſervations on Alphabetic Writing ſuppoſes them to be fragments of Egyptian antiquity brought by Cambyſes from the ſpoils of Thebes. The learned are generally agreed, that the Perſians were later in civilization than many of their neighbours; and they are not ſuppoſed to have any pretenſions to the invention of letters.

As the Arabians have been in poſſeſſion of the country

11 Nor by the Arabians.

try they now inhabit for upwards of 3700 years, without being intermixed with foreign nations, or ſubjugated by any other power, their language muſt be very ancient. The two principal dialects of it were that ſpoken by the Hamyarites and other genuine Arabs; and that of the Koreiſh, in which Mahomet wrote the Alcoran. The former is named by oriental writers *the Arabic of Hamyar*; the latter, *the pure*, or *defecated Arabic*. Mr Richardſon obſerves, as a proof of the richneſs of this language, that it conſiſts of 2000 radical words.

The old Arabic characters are ſaid to have been of very high antiquity; for Ebn Haſhem relates, that an inſcription in it was found in Yaman as old as the days of Joſeph. Hence ſome have ſuppoſed that the Arabians were the inventors of letters; and Sir Iſaac Newton is of opinion, that Moſes learned the alphabet from the Midianites, who were Arabians.

The alphabet of the Arabs conſiſts of 28 letters ſimilar to the ancient Cufic, in which the firſt copies of the Alcoran were written. The preſent Arabic characters were formed by Ebn Moklah, a learned Arabian, who lived about 300 years after Mahomet. The Arabian writers themſelves inform us, that their alphabet is not very ancient, and that they received it only a ſhort time before the introduction of Iſlamiſm.

12 Letters moſt probably invented in Phœnicia.

On this account of the pretenſions of different nations to the invention of letters, Mr Aſtle makes the following reflections. “The vanity of each nation induces them to pretend to the moſt early civilization; but ſuch is the uncertainty of ancient hiſtory, that it is difficult to determine to whom the honour is due. It ſhould ſeem, however, that the conteſt may be confined to the Egyptians, the Phœnicians, and the Chaldeans. The Greek writers, and moſt of thoſe who have copied them, decide in favour of Egypt, becauſe their information is derived from the Egyptians themſelves. The poſitive claim of the Phœnicians does not depend entirely upon the teſtimony of Sanchoniatho; the credit of his hiſtory is ſo well ſupported by Philo of Byblus his tranſlator, Porphyry, Pliny, Curtius, Lucan, and other ancient writers, who might have ſeen his works entire, and whoſe relations deſerve at leaſt as much credit as thoſe of the Egyptian and Greek writers. It muſt be allowed, that Sanchoniatho's hiſtory contains many fabulous accounts; but does not the ancient hiſtory of the Egyptians, the Greeks, and moſt other nations, abound with them to a much greater degree? The fragments which we have of this moſt ancient hiſtorian are chiefly furniſhed by Euſebius, who took all poſſible advantages to repreſent the Pagan writers in the worſt light, and to render their theology abſurd and ridiculous.

“The Phœnician and Egyptian languages are very ſimilar; but the latter is ſaid to be more large and full, which is an indication of its being of a later date. The opinion of Mr Wiſe, however, that the ancient Egyptians had not the knowledge of letters, ſeems to be erroneous; as they had commercial intercourſe with their neighbours the Phœnicians, they probably had the knowledge of letters, if their policy, like that of the Chineſe at this day, did not prohibit the uſe of them.

“The Chaldeans, who cultivated aſtronomy in the moſt remote ages, uſed ſymbols or arbitrary marks in their calculations; and we have ſhown, that theſe were the parents of letters. This circumſtance greatly favours their claim to the invention; becauſe Chaldea, and the countries adjacent, are allowed by all authors, both ſacred and profane, to have been peopled before Egypt; and it is certain that many nations ſaid to be deſcended from Shem and Japhet, had their letters from the Phœnicians, who are deſcended from Ham.

“It is obſervable, that the Chaldeans, the Syrians, Phœnicians, and Egyptians, all bordered upon each other; and as the Phœnicians were the greateſt as well as the moſt ancient commercial nation, it is very probable that they communicated letters to the Egyptians, the ports of Tyre and Sidon being not far diſtant from each other.

“Mr Jackſon is evidently miſtaken when he ſays, that letters were invented 2619 years before the birth of Chriſt. The deluge recorded by Moſes was 2349 years before that event; and if letters were not invented till 550 years after, as he aſſerts, we muſt date their diſcovery only 1799 years before the Chriſtian æra, which is 410 years after the reign of Menes the firſt king of Egypt, who, according to Syncellus and others, is ſaid to have been the ſame perſon with the Miſor of Sanchoniatho, the Mizraim of the Scriptures, and the Oſiris of the Egyptians; but whether this be true or not, Egypt is frequently called in Scripture *the land of Mizraim*.

“This Mizraim, the ſecond ſon of Amyn or Ham, ſeated himſelf near the entrance of Egypt at Zoan, in the year before Chriſt 2188, and 160 years after the flood. He afterwards built Thebes, and ſome ſay Memphis. Before the time that he went into Egypt, his ſon Taaut had invented letters in Phœnicia; and if this invention took place ten years before the migration of his father into Egypt, as Mr Jackſon ſuppoſes, we may trace letters as far back as the year 2178 before Chriſt, or 150 years after the deluge recorded by Moſes: and beyond this period, the written annals of mankind, which have been hitherto tranſmitted to us, will not enable us to trace the knowledge of them; though this want of materials is no proof that letters were not known until a century and an half after the deluge. As for the pretenſions of the Indian nations, we muſt be better acquainted with their records before we can admit of their claim to the firſt uſe of letters; eſpecially as none of their manuſcripts of any great antiquity have as yet appeared in Europe. That the Arabians were not the inventors of letters, has appeared by their own confeſſion.—Plato ſomewhere mentions Hyperborean letters very different from the Greek; theſe might have been the characters uſed by the Tartars or ancient Scythians.

13 Of antideluvian writing.

“It may be expected that ſomething ſhould be ſaid concerning the books mentioned by ſome authors to have been written before the deluge. Amongſt others, Dr Parſons, in his Remains of Japhet, p. 346. 359. ſuppoſes letters to have been known to Adam; and the Sabeans produce a book which they pretend was written by Adam. But concerning theſe we have no guide to direct us any more than concerning the ſuppoſed books of Enoch; ſome of which, Origin tells us, were found in Arabia Felix, in the dominions of the queen of Saba. Tertullian affirms, that he ſaw and read ſeveral pages of them; and in his treatiſe *De Habitu Mulierum*, he places thoſe books among the canonical: but St Jerom and St Auſtin look upon them to be apocryphal. William Poſtellus pretended to compile his book *De Originibus* from the book of Enoch; and Thomas Bangius publiſhed at Copenhagen, in 1657, a work which contains many ſingular relations concerning the manner of writing among the antediluvians, which contains ſeveral pleaſant ſtories concerning the books of Enoch.

"With regard to this patriarch, indeed, St Jude informs us, that he *propheſied*, but he does not ſay that he *wrote*. The writings, therefore, attributed to the antediluvians, muſt appear quite uncertain; though it might be improper to aſſert that letters were unknown before the deluge recorded by Moſes."

14
All the alphabets in the world cannot be proved to ariſe from one original.

Our author proceeds to ſhow that all the alphabets in the world cannot be derived from one original; becauſe there are a variety of alphabets uſed in different parts of Aſia, which vary in name, number, figure, order, and power, from the Phœnician, ancient Hebrew, or Samaritan. In ſeveral of theſe alphabets alſo, there are marks for ſounds peculiar to the language of the eaſt, which are not neceſſary to be employed in the notation of the languages of Europe.

None of the alphabets to the eaſt of Perſia have any connection with the Phœnician or its derivatives, except where the Arabic letters have been introduced by the conqueſt of the Mahometans. The foundation of all the Indian characters are thoſe called *ſhanſcrit*, or *ſungſkrit*. This ſignifies ſomething brought to perfection, in contradiſtinction to *prakrit*, which ſignifies vulgar or unpoliſhed. Hence the refined and religious language and characters of India are called *Sungſkrit*, and the more vulgar mode of writing and expreſſion *Prakrit*. From this Shanſcrit are derived the ſacred characters of Thibet, the Caſhmirian, Bengaleſe, Malabaric, and Tamoul; the Singaleſe, Siameſe, Maharattan, Concanee, &c. From the ſame ſource we may derive the Tangutic or Tartar characters, which are ſimilar, in their great outlines, to the Shanſcrit; though it is not eaſily determined which is derived from the other. The common Tartar is generally read, like the Chineſe, from top to bottom.

There are, however, ſeveral alphabets uſed in different parts of Aſia, entirely different not only from the Shanſcrit and all thoſe derived from it, but alſo from the Phœnician, and thoſe which proceed from it. Some of theſe are the alphabet of Pegu, the *Batta* characters uſed in the iſland of Sumatra, and the *Barman* or *Boman* characters uſed in ſome parts of Pegu. The names and powers of the letters of which theſe alphabets are compoſed, differ entirely from the Phœnician, or thoſe derived from them. It is impoſſible to aſſimilate their forms, and indeed it is by no means eaſy to conceive how the 50 letters of the Shanſcrit language could be derived from the Phœnician alphabet, which conſiſted originally only of 13; though it is certain, that by far the greater number of alphabets now in uſe are derived from the ancient Hebrew, Phœnician, or Samaritan.

15
Alphabets derived from the Phœnician.

Mr. Aſtle next proceeds to conſider what alphabets are derived from the Phœnician. Theſe he ſuppoſes to have been immediately the ancient Hebrew or Samaritan; the Chaldaic; the Baſtulian (A) or Spaniſh Phœnician; the Punic, Carthaginian, or Sicilian; and the Pelaſgian. From the ancient Hebrew proceeded the Chaldaic or ſquare Hebrew; the round Hebrew; and what is called the *running hand of the Rabbins*. The Pelaſgian gave birth to the Etruſcan, Eugubian, or Umbrian, Oſcan, Samnite, and Ionic Greek, written from the left. From the Chaldaic or ſquare Hebrew are derived the Syriac, and the ancient and modern Arabic. The Syriac is divided into the Eſtrangelo and Mendæan, and the modern Arabic has given riſe to the Perſian and Turkiſh. From the ancient Arabic are derived the Kufic or Oriental, the Mauritanic or Occidental; the African or Saracen, and the Mooriſh. The Ionic Greek gave riſe to the Arcadian, Latin, ancient Gauliſh, ancient Spaniſh, ancient Gothic, Coptic, Ethiopic, Ruſſian, Illyrian, or Sclavonic, Bulgarian and Armenian. From the Roman are derived the Lombardic, Viſigothic, Saxon, Gallican, Franco-Gallic or Merovingian, German, Caroline, Capetian, and modern Gothic.

The Punic letters are alſo called *Tyrian*, and were much the ſame with the Carthaginian or Sicilian. The Punic language was at firſt the ſame with the Phœnician; it is nearly allied to the Hebrew, and has an affinity with the Chaldee and Syriac. Some remains of it are to be met with in the Malteſe. To make a complete Punic, Carthaginian, or Sicilian alphabet, we muſt admit ſeveral pure Phœnician letters.

The Pelaſgi were likewiſe of Phœnician original; and, according to Sanchoniatho, the Dioſcuri and Cabiri wrote the firſt annals of the Phœnician hiſtory, by order of Taaut the inventor of letters. They made ſhips of burthen, and being caſt upon the coaſt near mount Caſius, about 40 miles from Peluſium, where they built a temple in the ſecond generation after the deluge related by Moſes, they were called *Pelaſgi* from their paſſing by ſea, and wandering from one country to another. Herodotus informs us, that the Pelaſgi were deſcendants of the Phœnician Cabiri, and that the Samothracians received and practiſed the Cabiric myſteries from them. The Pelaſgic alphabet prevailed in Greece till the time of Deucalion, when the Pelaſgi were driven out of Theſſaly or Oenotria by the Hellenes; after which ſome of them ſettled at the mouth of the Po, and others at Croton, now *Cartonæ* in Tuſcany. Their alphabet conſiſted of 16 letters, and the Tyrrhenian alphabet, brought into Italy before the reign of that prince, conſiſted of no more than 13. Deucalion is ſaid to have reigned about 820 years after the deluge, and 1529 before the Chriſtian æra.

That the Tyrrheni, Tyrſeni, or Hetruſci, ſettled in Italy long before this period, appears from the teſtimony of Herodotus, who informs us that a colony went by ſea from Lydia into Italy under Tyrrhenus; and Dionyſius of Halicarnaſſus proves that many authors called them Pelaſgi. He then cites Hellanicus Leſbicus, an author ſomewhat more ancient than Herodotus,

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(A) The Baſtuli are ſaid to have been a Canaanitiſh or Phœnician people who fled from Joſhua, and ſettled afterwards in Spain.

rodotus, to prove, that they were firſt called *Pelaſgi Tyrrheni*; and when they paſſed into Italy, they ſettled in that part of it called *Etruria.* Their emigration took place about the year of the world 2011, or 1993 years before the Chriſtian æra, which is 350 years before the Pelaſgi left Greece. Biſhop Cumberland adduces many proofs to ſhow that the Tyrrhenians originally came out of Lydia into Italy. Several Roman authors alſo ſpeak of this Lydian colony; and Horace compliments his patron Mæcenas upon his Lydian deſcent:

Lydorum quicquid Etruſcos
Incoluit fines, nemo generoſior eſt te.

The Etruſcan letters are Pelaſgic, and ſeveral of the Etruſcan inſcriptions are written in the Pelaſgic language. The Roman letters are Ionic. The Oſcan language was a dialect of the Etruſcan; their characters are nearer the Ionic or Roman than the Etruſcan. There is alſo very little difference between the Pelaſgian, Etruſcan, and moſt ancient Greek letters, which are placed from right to left. The Arcadians were ancient Greeks, and uſed the Ionic letters; but at what time they began to write from left to right is not known, as their chronology is very uncertain. The Etruſcan, Oſcan, and Samnite alphabets, are derived from the Pelaſgic; they differ from each other more in name than in form, but a far greater number are derived from the Ionic Greek; namely, the Arcadian, the Latin or Roman, and the others already enumerated. The Runic is immediately derived from the Gothic.

According to Dionyſius of Halicarnaſſus, the firſt Greek colony which came into Italy conſiſted of Arcadians under the conduct of Oenotrus the ſon of Lycaon, and fifth in deſcent from Phoroneus the firſt king of Argos, who reigned about 566 years before the taking of Troy, and 1750 years before the Chriſtian æra. Theſe Oenotrians were called *Aborigines:* and after they had been engaged for many years in a war with the Siculi, entered into an alliance with a colony of the Pelaſgi, who came out of Theſſaly into Italy, after having been driven from the former country.—About 1476 B. C. another colony of the Pelaſgi, who had been driven out of Theſſaly by the Curetes and Leleges, arrived in Italy, where they aſſiſted the Aborigines to drive out the Siculi; poſſeſſing themſelves of the greateſt part of the country between the Tiber and the Liris, and building ſeveral cities. Solinus and Pliny tell us, that the Pelaſgi firſt carried letters into Italy; and the latter diſtinguiſhes between the Pelaſgi and the Arcades: ſo the letters firſt carried into Italy were not the Ionic Greek, but thoſe more ancient Pelaſgic characters which the Pelaſgi carried with them before Deucalion and Cadmus are ſaid to have come into Bœotia and Theſſaly. The ſtory of Cadmus is much involved in fable; but it is agreed by moſt of the ancients, that the children of Agenor, viz. Cadmus, Europa, Phœnix, and Cilix, carried with them a colony, compoſed of Phœnicians and Syrians, into Aſia Minor, Crete, Greece, and Lybia, where they introduced letters, muſic, poetry, and other arts, ſciences, and cuſtoms, of the Phœnicians.

Dionyſius enumerates the following Greek colonies which came into Italy: 1. The Aborigines, under Oenotrus from Arcadia. 2. The Pelaſgic colony which came from Hœmonia or Theſſaly. 3. Another Arcadian colony which came with Evander from Palantium. 4. Thoſe who came from Peloponneſus with Hercules; and, 5. Thoſe who came with Æneas from Troy. It is not eaſy to diſcover when the Ionic way of writing from left to right was introduced into Italy; but it is certain, that it did not univerſally prevail even in Greece till ſeveral ages after it was found out. The Athenians did not comply with it till the year of Rome 350; nor was it practiſed by the Samnites even in the ſixth century of that city, or 230 years before Chriſt: for M. Gæbelin, Vol. VI. pl. 2. gives us the Samnite alphabet of that century, wherein the letters are placed from right to left; although the Ionic way of writing prevailed in ſome parts of Italy in the third century of Rome. " In time (ſays Pliny), the tacit conſent of all nations agreed to uſe the Ionic letters. The Romans conſented to this mode about the time of Tarquinius Priſcus their fifth king." The letters brought by Damaratus the Corinthian, the father of Tarquin, Mr Wiſe thinks, muſt have been the new or Ionic alphabet, and not the ſame with that brought by Evander 500 years before. After the Romans had eſtabliſhed the uſe of the Ionic letters, they ſeem not to have acknowledged the Pelaſgian and Etruſcan to have been Greek alphabets: the moſt learned of them knew none older than the Ionic, as appears from the Greek Farneſe inſcriptions of Herodes Atticus. This learned man, out of a regard to antiquity, cauſed the oldeſt orthography to be obſerved in the writing, and the letters to be delineated after the moſt antique forms that could be found; and they are plainly no other than the Ionic or right-handed characters.

See Plates XI & XII. for ſpecimens of the ancient alphabets here enumerated.

The ancient Gauliſh letters are derived from the Greek, and their writing approaches more nearly to the Gothic than that of the Romans: this appears by the monumental inſcription of Gordian, meſſenger of the Gauls, who ſuffered martyrdom in the third century with all his family. Theſe ancient Gauliſh characters were generally uſed by that people before the conqueſt of Gaul by Cæſar; but after that time the Roman letters were gradually introduced. The ancient Spaniards uſed letters nearly Greek before their intercourſe with the Romans. The ancient Gothic alphabet was very ſimilar to the Greek, and is attributed to Ulphilas, biſhop of the Goths, who lived in Mæſia about 370 years after Chriſt. He tranſlated the bible into the Gothic tongue. This circumſtance might have occaſioned the tradition of his having invented theſe letters; but it is probable that theſe characters were in uſe long before this time. The Runic alphabet is derived from the ancient Gothic.

The Coptic letters are derived immediately from the Greek. Some have confounded them with the ancient Egyptian; but there is a very material difference between them. The Ethiopic alphabet is derived from the Coptic.

The alphabet proceeding from that of the Scythians eſtabliſhed in Europe, is the ſame with what St Cyril calls the *Servien.* The Ruſſian, Illyrian or Sclavonic, and the Bulgarian, are all derived from the Greek. The Armenian letters differ very much from the Greek, from which they are derived, as well as from the Latin.

16
Alphabets derived from the Latin.

With regard to the alphabets derived from the Latin, the Lombardic relates to the manuſcrips of Italy;

the Viſigothic to thoſe of Spain; the Saxon to thoſe of England; the Gallican and Franco-Gallic or Merovingian to the manuſcripts of France; the German to thoſe of that country; and the Caroline, Capetian, and Modern Gothic, to all the countries of Europe who read Latin. The firſt ſix of theſe alphabets are before the age of Charlemagne, the laſt three poſterior to it. They are more diſtinguiſhed by their names than the forms of their characters, and the former indicate all of them to have been of Roman extraction. Each nation, in adopting the letters of the Romans, added thereto a taſte and manner peculiar to itſelf, which obviouſly diſtinguiſhed it from the writings of all other people; whence aroſe the differences between the writings of the Lombards, Spaniards, French, Saxons, Germans, and Goths, and all the ſtrange terms obſervable in the writings of the Francic Gauls or Merovingians; and thoſe of the Carlovingians their ſucceſſors may be traced from the ſame ſource. From theſe diſtinctions the name of *national writing* was derived.

The writing of Italy was uniform till the irruption of the Goths, who disfigured it by their barbarous taſte. In 569, the Lombards, having poſſeſſed themſelves of all Italy, excepting Rome and Ravenna, introduced that form of writing which goes under their name; and as the Popes uſed the Lombardic manner in their bulls, the name of *Roman* was ſometimes given to it in the 11th century; and though the dominion of the Lombards continued no longer than 206 years, the name of their writing continued in Italy from the 7th to the 13th century, and then ceaſed; when learning, having declined in that as well as in other countries, the manner of writing degenerated into the modern Gothic.

The Viſigoths introduced their form of writing into Spain, after having over-run that country; but it was aboliſhed in a provincial ſynod held at Leon in 1091, when the Latin characters were eſtabliſhed for all public inſtruments, though the Viſigothic were uſed in private writings for three centuries afterwards.

The Gauls, on being ſubjected by the Romans, adopted their manner of writing; but by ſubſequent additions of their own, their characters were changed into what is called the Gallican or *Roman Gallic* mode. This was changed by the Franks into the *Franco-Gallic* or *Merovingian* mode of writing, being practiſed under the kings of the Merovingian race. It took place towards the cloſe of the ſixth century, and continued till the beginning of the ninth.

The German mode of writing was improved by Charlemagne, and this improvement occaſioned another diſtinction in writing by introducing the alphabet named *Caroline*, which declined in the 12th century, and was ſucceeded in the 13th by the modern Gothic. In France it had degenerated by the middle of the 10th century, but was reſtored in 987 by Hugh Capet, whence it obtained the name of *Capetian*. It was uſed in England as well as Germany and France.

The modern Gothic, which ſpread itſelf all over Europe in the 12th and 13th centuries, is improperly named, as not deriving its origin from the writing anciently uſed by the Goths. It is, however, the worſt and moſt barbarous way of writing, and originated among the ſchoolmen in the decline of the arts; being indeed nothing elſe than Latin writing degenerated. It began in the 12th century, and was in general uſe, eſpecially among monks and ſchoolmen, in all parts of Europe, till the reſtoration of arts in the 15th century, and continued longer in Germany and the northern nations. The ſtatute-books are ſtill printed in Gothic letters. The moſt barbarous writing of the ſeventh, eighth, and ninth centuries, was preferable to the modern Gothic. It is diverſified in ſuch a manner as can ſcarce admit of deſcription; and the abbreviations uſed by the writers were ſo numerous, that it became very difficult to read it; which was one of the great cauſes of the ignorance of thoſe times. Along with this, however, the Lombardic, Gothic, Roman, Caroline, and Capetian modes of writing, were occaſionally uſed by individuals.

The idea that all the alphabets above mentioned are derived from the Roman, tends to prove the diſtinction of national writing, and is of great uſe in diſcovering the age of manuſcripts: for though we may not be able exactly to determine the time when a manuſcript was written, we may be able nearly to aſcertain its age. For example, if a writing is Merovingian, it may be declared not to be poſterior to the ninth, nor prior to the fifth, century. If another be Lombardic, it may be affirmed to be poſterior to the middle of the 6th, and prior to the 13th. Should it be Saxon, it cannot be of an earlier date than the 7th, nor later than about the middle of the 12th.

17
Letters could not take place but from a decompoſition of language.

Having conſidered whence the alphabets now in uſe throughout the various nations of the world are derived, it remains to ſay ſomething concerning them as the elements of words, or how far they are capable of expreſſing thoſe ſounds, which, by proper combination and arrangement, conſtitute articulate language. The number of ſimple ſounds in any language cannot be very numerous; and it is plainly theſe ſimple ſounds alone that we have occaſion to repreſent by alphabetical characters. Hence the perſon who firſt invented letters, muſt have been capable of analyſing language in a manner which ſeems by no means eaſy to do, and concerning which even the learned among ourſelves are not yet agreed. It is this difficulty which has produced the great diverſity in the number of alphabetical characters uſed by different nations; and where we ſee a vaſt number of them uſed, we may account the writing not the better, but much the worſe for it; and whoever the pretended inventor was, it is more reaſonable to ſupptoſe hat he had disfigured an alphabet already invented, by unneceſſary additions, than been the author of one himſelf.

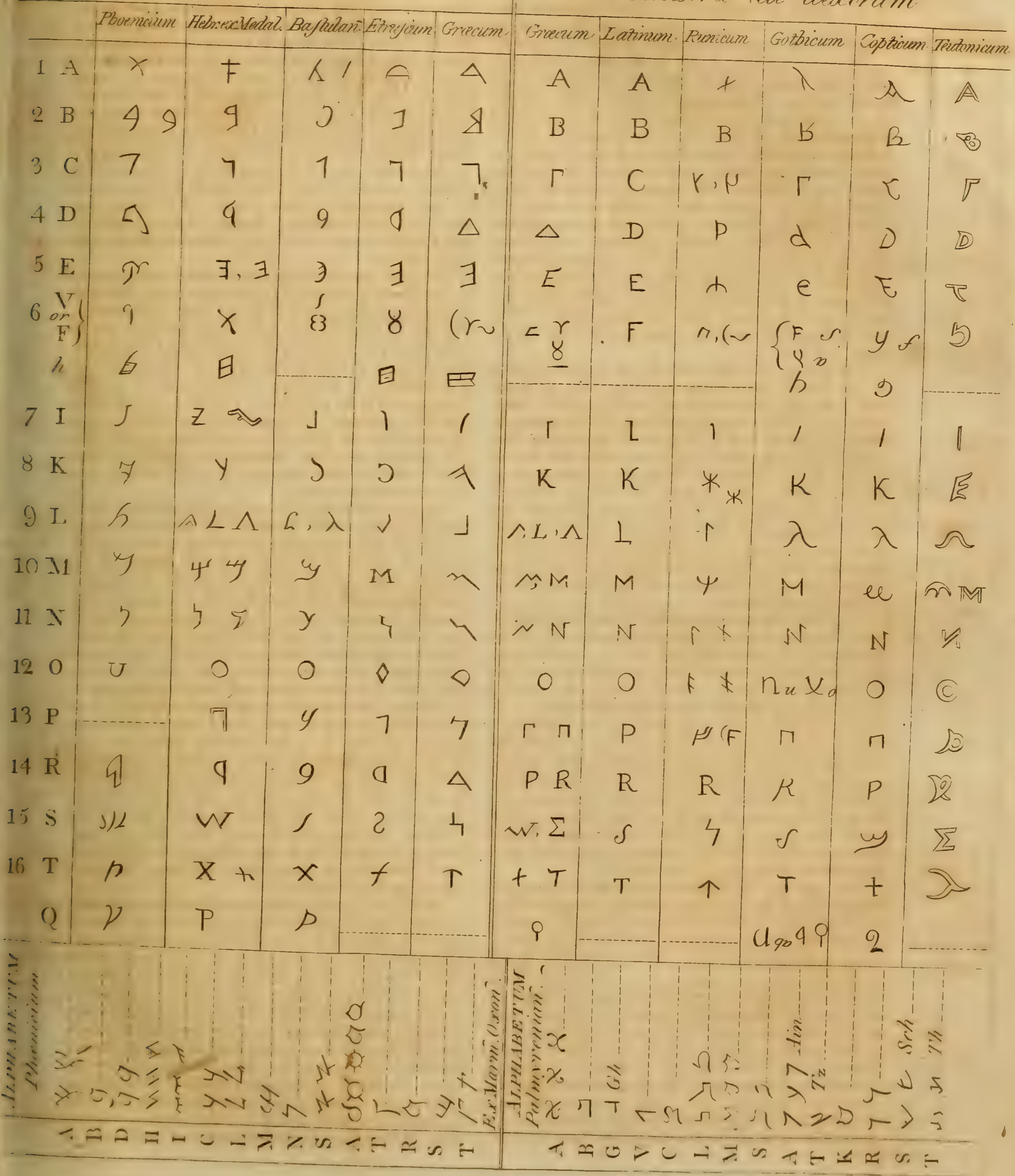
18
Probably not the r ſult of a progreſſiv evolution the huma powers.

When we conſider alphabetical characters as thus reſulting from an analyſis of language, it will by no means appear probable that it was derived from a gradual and progreſſive operation of the human mind through many ages. There is not the leaſt affinity betwixt repreſenting an object by a picture and finding out the ſounds which compoſe the word by which it is expreſſed; nor, though a nation had been in uſe to repreſent things either in this method, or by any kind of arbitrary marks, for thouſands of years, could the one ever have led to the other. Arbitrary marks muſt always be the ſame with pictures in this reſpect, that they muſt always be fixed to particular objects, and thus be increaſed *ad infinitum*. Letters, on the other hand, are indifferent to all

ALPHABETA ANTIQUISSIMA

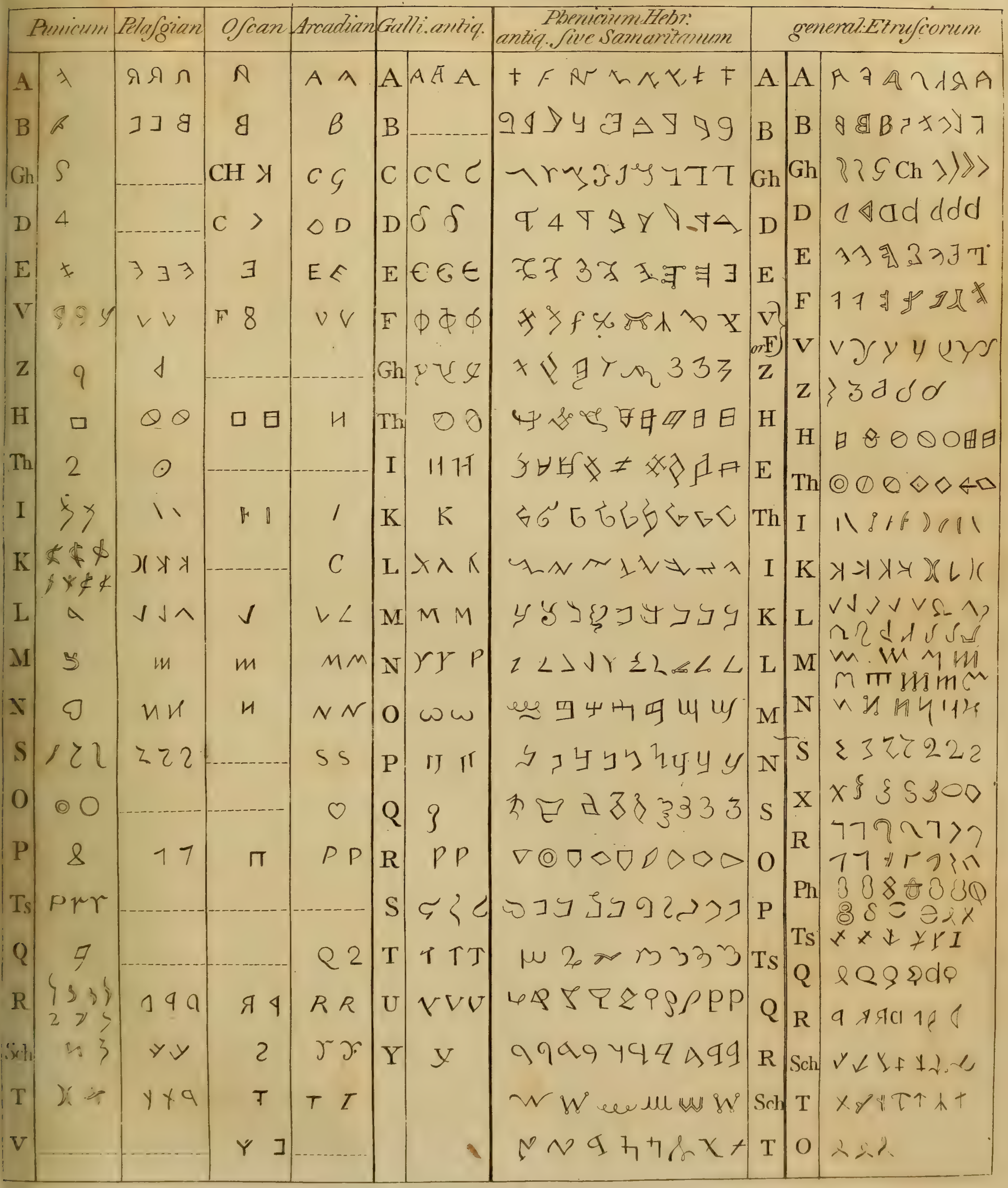
Plate XI

a dextra ad sinistram exarat — *a sinistra ad dextram*


Phœnicium
Hebr. ex Medal.
Bastulan.
Etruscum
Græcum
Græcum
Latinum
Runicum
Gothicum
Copticum
Teutonicum
1 A
2 B
3 C
4 D
5 E
6 V or F
h
7 I
8 K
9 L
10 M
11 N
12 O
13 P
14 R
15 S
16 T
Q
ALPHABETUM Phœnicium
Ex Marm. Oxon.
ALPHABETUM Palmyrenum
Gh
Ain
Tz
Sch
Th
A B D H I C L M N S A T R S T
A B G V C L M S A T K R S T

ALPHABETA ANTIQUA.

Plate XII


Punicum
Pelaſgian
Oſcan
Arcadian
Galli. antiq.
Phenicium Hebr. antiq. ſive Samaritanum
general. Etruſcorum
A B Gh D E V Z H Th I K L M N S O P Ts Q R Sch T V
A B C D E F Gh Th I K L M N O P Q R S T U Y
A B Gh D E V or F Z H E Th I K L M N S O P Ts Q R Sch T
A B Gh D E F V Z H Th I K L M N S X R Ph Ts Q R Sch T O
CH
Ch

all objects; and therefore, by their combinations, which are more numerous than as many arbitrary marks as we could remember, may expreſs all the objects in nature. This might furniſh an argument of ſome ſtrength for the divine revelation of writing, were it not that other arts, ſeemingly as uſeful, and as difficult to be invented, have been expreſsly aſcribed to particular perſons whom we cannot ſuppoſe to have been divinely inſpired. Thus metallurgy, muſic, the keeping of cattle, the uſe of tents, are all aſcribed to a ſingle family; and though writing be not expreſsly mentioned as an invention in Scripture, there is no reaſon to have recourſe to a revelation for it, as long as the human faculties are known to have been ſufficient for the invention of it. Nevertheleſs, if we take a review of the different arts which mankind have invented, we ſhall find, that few of them reſulted from any gradual progreſs or evolution of the powers of the human mind, but rather by ſome ſudden and almoſt unaccountable turn of thought in an individual. Thus, the art of printing, little inferior in its utility to that of writing, lay hid for ages, and was at laſt invented we ſcarce know how; ſo that if one inclined to ſuppoſe this a divine revelation, he could be at little loſs for arguments to ſupport his hypotheſis. This was what all the inventions and evolutions of human powers ſince the creation had never been able to accompliſh; yet nobody believes that it required ſupernatural abilities to be the author of this art, becauſe we ſee plainly that it might have occurred to the human mind from various ſources, and are ſurpriſed that it did not occur long before. In like manner, the method of accounting for the celeſtial motions by the united forces of projection and gravitation, was no reſult of the progreſs that mankind had made in ſcience, but luckily occurred to Mr Horrox, without any thing that we know to direct him, or perhaps from cauſes almoſt unknown to himſelf. Thus alſo, the ſteam-engine, aeroſtation, &c. were ſuddenly invented only by a ſlight review of principles well known before, and which had been a thouſand times overlooked by thoſe who might have invented both. Alphabetic writing, therefore, might have been no deduction from hieroglyphic or picture writing, from which it is eſſentially different; and it ſeems to be ſome confirmation of this, that all nations who ever pretended to the invention of letters, have aſcribed it to the labours of one particular perſon, without taking notice of the progreſs made towards it in preceding ages.

19
Of the elementary ſounds of language.

The learned author of Hermes informs us, that to about 20 plain elementary ſounds, we owe that variety of articulate voices which have been ſufficient to explain the ſentiments of ſuch an innumerable multitude as all the paſt and preſent generations of men. Mr Sheridan ſays, that the number of ſimple ſounds in our tongue are 28; while Dr Kenrick ſays, that we have only 11 diſtinct ſpecies of articulate ſounds, which even by contraction, prolongation, and compoſition, are increaſed only to the number of 16; every ſyllable or articulate ſound in our language being one of the number. Biſhop Wilkins and Dr William Holder ſpeak of 33 diſtinct ſounds.

After the analyſis or decompoſition of language into the elementary ſounds, the next towards the notation of it by alphabetical characters, would be the delineation of a ſeparate mark or letter to repreſent each ſound; which marks, though few in number, would admit of ſuch a variety of arrangements and combinations, as might be capable of producing that infinity of articulate ſounds which compoſe language. The ingenious Wachter, in his *Natura et Scriptura Concordia*, p. 64, endeavours to ſhow, that ten marks or characters are ſufficient for this purpoſe.—His ſcheme is as follows:

Genus.	*Figura.*	*Poteſtas.*
Vocal.	○	a. e. i. o. u.
Guttural.	♀	k. c. ch. q. g. h.
Lingual.	∠	l.
Lingual.	⌶	d. t.
Lingual.	—⊃	r.
Dental.	⊓	ſ.
Labial.	3	b. p.
Labial.	𝔪	m.
Labial.	⊨	s. ph. v. w.
Naſal.	ʌ	n.

If this is the caſe, then the moſt ſimple alphabet, which conſiſted only of 13 letters, muſt have been abundantly ſufficient to anſwer all the purpoſes of mankind, and much of our twenty-four letter alphabet may appear ſuperfluous. That able mathematician Tacquet has calculated the various combinations of the 24 letters, even without any repetition, to amount to no fewer than 620,448,401,733,239,439,360,000; while Clavius makes them only 5,852,616,738,497,664,000. Either of theſe numbers, however, are *infinite* to the the human conceptions, and much more than ſufficient to expreſs all the ſounds that ever were articulated by man. As there are more ſounds in ſome languages than in others, it follows of courſe, that the number of elementary characters, or letters, muſt vary in the alphabets of different languages. The Hebrew, Samaritan, and Syriac alphabets, have 22 letters; the Arabic 28, the Perſian and Egyptian, or Coptic, 32; the preſent Ruſſian 41; the Shanſcrit 50; while the Caſhmirian and Malabaric are ſtill more numerous. The following is the ſcheme of the Engliſh alphabet as given by Mr Sheridan in his Rhetorical Grammar, p. 9.

Number of ſimple ſounds in our tongue 28.

9 *Vowels*, $\overset{3}{a}$ $\overset{1}{a}$ $\overset{2}{a}$ $\overset{3}{e}$ $\overset{2}{o}$ $\overset{3}{o}$ $\overset{1}{e}$ $\overset{1}{i}$ $\overset{1}{u}$
hall hat hate beer note nooſe bet fit but
w y
ſhort oo ſhort ee

19 *Conſonants*, } eb ed ef eg ek el em en ep er es
et ev ez eth *eth* eſh ezh ing.

2 *Superfluous*, *c* which has the power of *ek* or
q, that of *ek* before *u*.

2 *Compound*, *j*, which ſtands for *edzh* ;
x, for *ks* or *gz*.
1 *No letter*, *h*, merely a mark of aſpiration.

Conſonants divided into Mutes and Semivowels ;

6 *Mutes*,	eb ed eg ek ep et.
3 *Pure Mutes*,	ek ep et.
3 *Impure*,	eb ed eg.
13 *Semivowels*, or *liquids*,	ef el em en er eſs ev ez *eth* eth eſh ezh ing.
9 *Vocal*,	el em en er ev ez eth ezh ing.
4 *Aſpirated*,	ef eſs *eth* eſh.

Divided again into

4 *Labial*,	eb ep ev ef.
8 *Dental*,	ed et eth *eth* ez eſs ezh eſh.
4 *Palatine*,	eg ek el er.
3 *Naſal*,	em en ing.

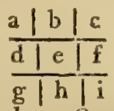
21 Imperfection in the Engliſh alphabet.

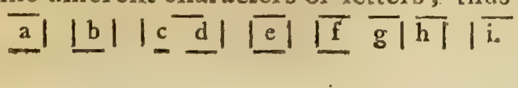
Mr Sheridan obſerves, that our alphabet is ill calculated for the notation of the Engliſh tongue, as there are many ſounds for which we have no letters or marks: and there ought to be nine more characters or letters to make a complete alphabet, in which every ſimple ſound ought to have a mark peculiar to itſelf. The reaſon of the deficiency is, that the Roman alphabet was formerly adopted for the notation of the Engliſh language, though by no means ſuited to the purpoſe.

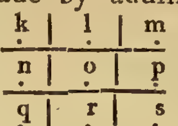
22 Of the forms of letters.

It now remains only to take ſome notice of the forms of the different letters; ſome knowledge of which is abſolutely neceſſary for aſcertaining the age and authenticity of inſcriptions, manuſcripts, charters, and ancient records. Many authors are of opinion that letters derive their forms from the poſitions of the organs of ſpeech in their pronunciation. Van Helmont has taken great pains to prove, that the Chaldaic characters are the genuine alphabet of Nature; becauſe, according to him, no letter can be rightly ſounded without diſpoſing the organs of ſpeech into an uniform poſition with the figure of each letter; and in ſupport of this ſyſtem, he has anatomiſed the organs of articulation.

Mr Nelme has endeavoured to ſhow, that all elementary characters or letters derive their forms from the line and the circle. His alphabet conſiſts of 13 radical letters, four diminiſhed, and four augmented.—The radicals are L, O, S, A, B, C, D, N, U, I, E, M, R.—H, according to him is derived from A; P from B; T from D; and F from U: theſe are all called diminiſhed letters. The augmented ones are Z from S; G from C; W from U; and Y from I. He proves that his characters are very ſimilar to thoſe of the ancient Etruſcans; but all characters are compoſed either of lines, and circles of the former, or of parts of the latter.—Mr Gebelin deduces them from hieroglyphic repreſentations, and has given ſeveral delineations of human figures, trees, &c. in confirmation of this hypotheſis.

One of the moſt ſimple alphabets has been formed, by making two perpendicular and two horizontal lines: thus, 

from which may be deduced nine different characters or letters; thus


Nine more may be made by adding a point to each, and as many more as 

may be ſufficient for the notation of any language, by adding two or more points to each character. Though theſe ſquare characters are not calculated for diſpatch; yet they may be made as expeditiouſly, or more ſo, than the Tartar, the Bramin, the Caſhmirian, or many others. Writing compoſed of theſe characters, is at firſt ſight ſomewhat like the Hebrew. Mr Dow, author of the hiſtory of Indoſtan, lately formed a new language and alphabet. This language, and the characters formed for its notation, were ſo eaſy, that a female of his acquaintance acquired a knowledge of them in three weeks, and correſponded with him therein during their intimacy.

23 New language invented by Mr Dow.

ALPHÆNIX, white barley-ſugar, to which is given an extraordinary name, to render it more valuable. This ſugar, which is thought good for colds, is made of common ſugar, which is boiled until it becomes eaſy to crack, when they pour it upon a marble table, greaſed with oil of ſweet almonds, and mould it into various figures with a braſs crotchet. It is eaſily falſified with ſtarch.

ALPHERY (Mikipher), born in Ruſſia, and of the Imperial line. When that country was torn to pieces by inteſtine quarrels, in the latter end of the 16th century, and the royal houſe particularly was ſo ſeverely perſecuted by impoſtors, this gentleman and his two brothers were ſent over to England, and recommended to the care of Mr Joſeph Biddel, a Ruſſian merchant. Mr Biddel, when they were of age fit for the univerſity, ſent them all three to Oxford, where the ſmall-pox unhappily prevailing, two of them died of it. We know not whether this ſurviving brother took degrees or not, but it is very probable he did, ſince he entered into holy orders; and in the year 1618, had the rectory of Wooley in Huntingtonſhire, a living of no very conſiderable value, being rated at under L.10 in the king's books. Here he did his duty with great cheerfulneſs and alacrity; and although he was twice invited back to his native country by ſome who would have ventured their utmoſt to have ſet him on the throne of his anceſtors, he choſe rather to remain with his flock, and to ſerve God in the humble ſtation of a pariſh prieſt. Yet in 1643, he underwent the ſevereſt trials from the rage of the fanatics; who, not ſatisfied with depriving him of his living, inſulted him in the moſt barbarous manner; for having procured a file of muſqueteers to pull him out of his pulpit, as he was preaching on a Sunday, they turned his wife and ſmall children into the ſtreet, into which alſo they threw his goods. The poor man in this diſtreſs raiſed him a tent under ſome trees in the church-yard, over againſt his houſe, where he and his family lived for a week. One day having gotten a few eggs, he picked up ſome rotten wood and dry ſticks, and with theſe made a fire in the church-porch, in order to boil them; but ſome of his adverſaries, to ſhow how far they could carry their rage againſt the church, for this poor man was ſo harmleſs they could have none againſt him, came and kicked about his fire, threw down his ſkillet and broke his eggs. After this, having ſtill a little money, he made a ſmall purchaſe in that neighbourhood, built him a houſe, and lived there ſome years. He was encouraged to this by a preſbyterian miniſter who came in his room, who honeſtly paid him the fifth part of the annual income of the living, which was the allowance made by parliament to ejected miniſters, treated him with great humanity, and did him all the ſervices in his power. It is a great misfortune that this gentleman's name is not preſerved, his conduct in this reſpect being the more laudable, becauſe it was not a little ſingular. Afterwards, probably on the death or removal of this gentleman, Mr Alphery left Huntingtonſhire, and came and reſided at Hammerſmith till the Reſtoration put him in poſſeſſion of his living again. He returned on this occaſion to Huntingtonſhire, where he did not ſtay long; for being upwards of 80, and withal very infirm, he could not perform the duties of his function. Having, therefore, ſettled a curate, he retired to his eldeſt ſon's houſe at Hammerſmith, where ſhortly after he died, full of years and of honour.

ALPHEUS, (Strabo); ALPHEIUS, (Ptolemy); a noted and large river of the Peleponneſus; which, riſing in, and after ſeveral windings running through, Arcadia, and by Olympia in Elis, with a ſouth-weſt courſe, pours into the Sinus Chelonites, about ten miles to the ſouth of Olympia. It has a common ſpring with the Eurotas, at the foot of mount Parthenius, near the village Aſea, (Strabo.) The Alpheus and Eurotas mix and run together for 20 ſtadia; after which, they enter a ſubterraneous paſſage at Mantinea; then again emerge, the Eurotas in Laconica, and the Alpheus in the territory of Megalopolis, (Pauſanias.) The poets fable ſtrange things of this river; particularly, that, out of love to the nymph *Arethuſa*, it runs under the ſea to Sicily, and burſts out at the fountain of that name in Syracuſe, (Virgil). Its waters are reckoned good in the leproſy, which is called Αλφος by the Greeks; and hence the name *Alpheus*.—Pauſanias adds, that the Eleans had a law, which condemned any woman to death that ſhould either appear at the Olympic games, or even croſs this river during that ſolemnity: and the Eleans add, that the only woman who tranſgreſſed it, had diſguiſed herſelf in the habit of a maſter or keeper of theſe games, and conducted her ſon thither; but when ſhe ſaw him come off victorious, her joy made her forget her diſguiſe, ſo that her ſex was diſcovered. She was pardoned, but from that time a law was made that the keepers ſhould appear there naked.

ALPHONSIN, in ſurgery, an inſtrument for extracting bullets out of gun-ſhot wounds. This inſtrument derives its name from the inventor Alphonſus Ferrier, a phyſician of Naples. It conſiſts of three branches, which are cloſed by a ring. When cloſed and introduced into the wound, the operator draws back the ring towards the handle, upon which the branches opening take hold of the ball; and then the ring is puſhed from the haft, by which means the branches graſp the ball ſo firmly, as to extract it from the wound.

ALPHONSUS X. king of Leon and Caſtile, ſurnamed the Wiſe, was author of the aſtronomical tables called *Alphonſine*. Reading of Quintus Curtius gave him ſuch delight, that it recovered him out of a dangerous illneſs. He read the Bible fourteen times, with ſeveral comments on it. He is ſaid to have found fault with the ſtructure of the mundane ſyſtem, and has been charged with impiety on that ſcore; but unjuſtly, for he only found fault with the involved ſyſtem of ſome aſtronomers. He was dethroned by his ſon Sancho; and died of grief, A. D. 1284.

ALPINI (Proſpero), a famous phyſician and botaniſt, born in the Venetian territory, in 1553. He travelled into Egypt to acquire a knowledge of exotic plants, and was the firſt who explained the fructification and generation of plants by the ſexual ſyſtem. Upon his return to Venice, in 1586, Andrea Doria, prince of Melfi, appointed him his phyſician: and he diſtinguiſhed himſelf ſo much in this capacity, that he was eſteemed the firſt phyſician of his age. The republic of Venice began to be uneaſy, that a ſubject of theirs, of ſo great merit as Alpini, ſhould continue at Genoa, when he might be of ſo much ſervice and honour to their ſtate: they therefore recalled him in 1593, to fill the profeſſorſhip of botany at Padua; and he had a ſalary of 200 florins, which was afterwards raiſed to 750. He diſcharged this office with great reputation; but his health became very precarious, having been much broken by the voyages he had made. According to the regiſter of the univerſity of Padua, he died the 5th of February 1617, in the 64th year of his age; and was buried the day after, without any funeral pomp, in the church of St Anthony.—Alpini wrote the following works in Latin: 1. Of the phyſic of the Egyptians, in four books. Printed at Venice, 1591, in 4to. 2. A treatiſe concerning the plants of Egypt. Printed at Venice, 1592, in 4to. 3. A dialogue concerning balſams. Printed at Venice, 1592, in 4to. 4. Seven books concerning the method of forming a judgment of the life or death of patients. Printed at Venice, 1691, in 4to. 5. Thirteen books concerning methodical Phyſic. Padua, 1611, folio, Leyden, 1719, in 4to. 6 A Diſputation held in the ſchool at Padua, concerning the Raphonticum. Padua, 1612, and 1629, 4to. 7. Of exotic plants, in two books. Venice, 1699, in 4to. He left ſeveral other works, which have never been printed; particularly, 8. The fifth book concerning the phyſic of the Egyptians. 9. Five books concerning the natural hiſtory of things obſerved in Egypt, adorned with a variety of draughts of plants, ſtones, and animals.

ALPINIA, in botany: A genus of the monogynia order, belonging to the monandria claſs of plants; and in the natural method ranking under the 8th order, *Scitamineæ*. The characters are: The *calyx* is a perianthium above, ſmall, and trifid: The *corolla* is monopetalous, unequal, and as if doubled: The *ſtamina* conſiſt of one filament, with linear antheræ joining to the margin: The *piſtillum* has a roundiſh germen, beneath; the ſtylus ſimple, and the ſtigma obtuſely trigonous: The *pericarpium* is a fleſhy ovate trilocular capſule, with three valves: The *ſeeds* are ovate, and very numerous; the receptaculum is pulpy and very large. Of this genus there is but one ſpecies, which is a native of the Weſt Indies, where it grows naturally in moiſt places. The leaves decay every winter, and are puſhed out from the roots in the ſpring, like the ginger and maranta; ſo muſt be managed in the ſame manner as directed for theſe two plants, and may be propagated by parting the roots when the leaves decay.

ALPISTE, or Alpia, a ſort of ſeed uſed to feed birds with, eſpecially when they are to be nouriſhed for breeding. The alpiſte ſeed is of an oval figure, of a pale yellow, inclining to an iſabel colour, bright and gloſſy. It is an article of the corn-chandlers, and ſeedſman's trade.

ALPS (anc. geog.) a range of high mountains, ſeparating Italy from Gaul and Germany, in the form of a creſcent. They take their riſe from the Vada Sabatia, or Savona; and reach to the Sinus Flanaticus (now Golfo di Carnaro of the Adriatic), and the ſprings of the river Colapis (now the Kulpe) extending, according to Livy, 2000 ſtadia in length, or 250 miles: they are divided into ſeveral parts, and accordingly have different names. From Savona to the ſprings of the Varus, where the Alps lie againſt the ſea of Genoa, they are called *Maritimæ*, now *le Montagne di Tenda*. Theſe extend from ſouth to north, between Gaul to the weſt, and Genoa to the eaſt, beginning at Monaco on the Mediterranean; then running out thro' the eaſt of the county of Nice, and between that and the marquiſate of Saluzzo, terminate at length at mount Viſo, between Dauphine and Piedmont. Hence to Suſa run the *Alpes Cottiæ* (Sueton.); *Cottanæ* (Tacitus); mountains extremely high, ſeparating Dauphine from Piedmont, and extending from mount Viſo to Mount Cenis, between the *Alpes Maritimæ* to the ſouth, and the *Graiæ* to the north. The *Alpes Graiæ* (Pliny), ſo called from the paſſage of Hercules, begin from mount Cenis, where the *Cottiæ* terminate; and run out between Savoy and the Tarenteſe to the weſt, and Piedmont and the Duche d'Aouſte to the eaſt, quite to the Great St Barnard, where the *Alpes Penninæ* begin. They are alſo called by ſome *Graiæ Alpes*, and *Graius Mons* (Tacitus); which extend from weſt to eaſt, between St Bernard and the Adula, or St Godart; and thus they run out between the Valeſe to the north, and the Milaneſe to the ſouth. With theſe are continued the *Alpes Rhæticæ*, to the head of the river Piave; a part of which are the *Alpes Tridentinæ*, to the north of Trent. To theſe join the *Alpes Noricæ*, reaching to Doblach in Tyrol, to the north of the river Tajamento: thence begin the *Alpes Carnicæ*, or of *Carniola*, extending to the ſprings of the Save: and the laſt, called *Alpes Pannonicæ*, and *Juliæ*, extend to the ſprings of the Kulpe. Some, however, extend the Alps to the north of Dalmatia; others, again, to Thrace and the Euxine. But their termination at the Kulpe, as above, is more generally received. They were formerly called *Alpia*, and *Alpionia* (Strabo). Through theſe mountains Hannibal forced his paſſage into Italy, by pouring vinegar on the rock, heated by burning large piles of wood on them, by which means they became crumbled (Livy.) They are covered with perpetual ſnow.

The Alps are the higheſt mountains in Europe; being, according to ſome geometricians, about two miles in perpendicular height. They begin at the Mediterranean; and ſtretching northward, ſeparate Piedmont and Savoy from the adjacent countries; whence directing their courſe to the eaſt, they form the boundary between Switzerland and Italy, and terminate near the extremity of the Adriatic Sea, north-eaſt of Venice. It was over the weſtern part of theſe mountains, towards Piedmont, that Hannibal forced his paſſage into Italy.

The proſpect from many parts of this enormous range of mountains is extremely romantic, eſpecially towards the north-weſt. One of the moſt celebrated is the Grande Chartreuſe, where is a monaſtery founded by St Bruno about the year 1084. From Echelles, a little village in the mountains of Savoy, to the top of the Chartreuſe, the diſtance is ſix miles. Along this courſe, the road runs winding up, for the moſt part not ſix feet broad. On one hand is the rock, with woods of pine trees hanging over head; on the other a prodigious precipice almoſt perpendicular; at the bottom of which rolls a torrent, that, ſometimes tumbling among the fragments of ſtone which have fallen from on high, and ſometimes precipitating itſelf down vaſt deſcents with a noiſe like thunder, rendered yet more tremendous by the echo from the mountains on each ſide, concurs to form one of the moſt ſolemn, the moſt romantic, and moſt aſtoniſhing ſcenes in nature. To this deſcription may be added the ſtrange views made by the crags and cliffs, and the numerous caſcades which throw themſelves from the very ſummit down into the vale. On the top of the mountain is the convent of St Bruno, which is the ſuperior of the whole order. The inhabitants conſiſt of 100 fathers, with 300 ſervants, who grind their corn, preſs their wine, and perform every domeſtic office, even to the making of their clothes. In the Album of the fathers is an admired alcaic ode, written by the late ingenious Mr Gray when he viſited the Chartreuſe, and which has ſince been publiſhed among his works.

The glaciers of Savoy are alſo juſtly reckoned among the moſt ſtupendous works of nature. Theſe are immenſe maſſes of ice, lodged upon the gentler declivities amidſt the Alps, and exhibiting repreſentations beyond conception fantaſtic and pictureſque. In the extraordinary narrative of Mr Bourrit's journey hither, we meet with the following account of the Prieuré, in the valley of Chamouni. We had, ſays he, the magnificent proſpect of a chain of mountains, equally inacceſſible, and covered with ice; and above the reſt that of Mount Blanc, whoſe top ſeemed to reach, and even pierce, the higheſt region of the clouds. The chain upon which this mountain looks down like a giant, is compoſed of maſſes of rocks, which terminate in pikes or ſpires, called the *Needles*, and which are ranged like tents in a camp. Their ſides appear lighter and more airy, from the ornament of ſeveral hollow breaks and furrows fretted in the rock itſelf, as well as from the different ſtreaks and panes of ice and ſnow, which, without changing the general character of their form, or the majeſty of their appearance, give them a pictureſque variety. Lower down, the eye ſurveys with raviſhment the hills of ice, and the ſeveral glaciers, extending almoſt into the plain, whilſt this appears like an artificial garden, embelliſhed with the mixture of a variety of colours. We have a pictureſque oppoſition to this chain, which is formed by innumerable mountains at the diſtance of near 50 leagues, between whoſe tops we have a glimpſe of thoſe ſeveral plains which they environ.

M. de Sauſſure, who had viſited thoſe mountains about two months before M. Bourrit, felt himſelf naturally electrified in this place. This extraordinary phenomenon ſeems not to have been experienced by the latter or his company; but they heard a long-continued rumbling noiſe, like that of thunder, which was rendered more awful by the ſilence of the place where they ſtood. This noiſe proceeded from the ſubſequent cauſes, viz. the avalanches of ſnow, which ſeparated from the tops of the mountains, and rolled down to the bottom; conſiderable fragments of the rocks which followed them, overturning others in their fall; and maſſy blocks of ice, which precipitated from the ſummits.

The valley of Montanvert appears to be peculiarly romantic. Here, ſays M. Bourrit, we beheld a ſpacious icy plain entirely level. Upon this there roſe a mountain all of ice, with ſteps aſcending to the top, which ſeemed the throne of ſome divinity. It likewiſe took the form of a grand caſcade, whoſe figure was beyond conception beautiful; and the ſun, which ſhone upon it, gave a ſparkling brilliance to the whole. The valley on our right hand was ornamented with prodigious glaciers, that, ſhooting up to an immeaſurable height between the mountains, blend their colours with the ſkies, which they appear to reach.

Alps, beſides its proper ſignification, by which it denotes a certain chain of mountains which ſeparate Italy from France and Germany, is frequently uſed as an appellative to denote any mountains of extraordinary height or extenſive range. In this ſenſe, Auſonius and others call the Pyrenean mountains, *Alps*: and Gellius the Spaniſh Alps, *Alpini Hiſpani*.

Hence alſo we ſay, the *Britiſh Alps*, the *Aſiatic Alps*, the *Alps of America*.

The *Scottiſh Alps* terminate in a moſt ſublime and abrupt manner, at the great promontory the Alta Ripa of Ptolemy, the *Ord* or *Aird*, i. e. the *Height, of Caithneſs*. The upper part is covered with gloomy heath; the lower is a ſtupendous precipice, excavated into vaſt caverns, the haunt of ſeals and different ſea-fowl. On the eaſtern ſide of the kingdom, this is the ſtriking termination of the vaſt mountains of Scotland which form its Highlands, the habitation of the original inhabitants, driven from their ancient ſeats by the anceſtors of Lowland Scots, deſcendants of Saxons, French, and Normans; congenerous with the Engliſh, yet abſurdly and invidiouſly diſtinguiſhed from them. Language, as well as ſtriking natural boundaries, mark their place. Their mountains face on the weſt the Atlantic ocean; wind along the weſt of Caithneſs; among which Morvern and Scaraben, Ben-Hop and Ben-Lugal, ariſe pre-eminent. Sutherland is entirely Alpine, as are Roſsſhire and Inverneſsſhire. Their *Summæ Alpes* are, Meal Fourvounich, the Coryarich, Benewiſh, and Beneviſh near Fort William; the laſt of which is reported to be 1450 yards in height. Great part of Aberdeenſhire lies in this tract. It boaſts of another Morvern, ſoaring far beyond the others. This is in the centre of the Grampian hills, and perhaps the higheſt from the ſea of any in Great Britain. They again comprehend the eaſtern part of Perthſhire, and finiſh on the magnificent ſhores of Lochlomond; on the eaſtern ſide of which Benlomond riſes, diſtinguiſhed among its fellows. From hence the reſt of North Britain forms a chain of humble hills; but in Cumberland, part of Weſtmoreland, Yorkſhire, Lancaſhire, and Derbyſhire, the Alps reſume their former majeſty. A long and tame interval ſucceeds. The long ſublime tract of Wales ariſes, the ancient poſſeſſion of the ancient Britiſh race. From the Ord, the great mountains recede inland, and leave a vaſt flat between their baſes and the ſea, fronting the waves with a ſeries of lofty rocky precipices, as far as the little creek of Staxigo; the whole a bold, but moſt inhoſpitable ſhore for ſhipping. Wick and Staxigo have indeed their creeks, or rather chaſms, which open between the cliffs, and may accidentally prove a retreat, unleſs in an eaſtern gale.

The *Aſiatic Alps* are deſcribed under the articles *Altaic Chain* and *Werturian Mountains*.

The *American Alps* are, The Andes or *Cordilleras*, in South America; and the Apalachian or *Allegany* mountains, in North America.

The higheſt ground in North America is placed by Captain Carver in lat. 47° weſt long. from Lond. 98° between a lake from which the Oregon flows, and another called *White-bear Lake*, from which ariſes the Miſſiſſippi.

This exalted ſituation is part of the Shining Mountains, which are branches of the vaſt chain which pervades the whole continent of America. It may be fairly taken from the ſouthern extremity, where Staten Land and Terra del Fuego riſe out of the ſea as inſulated links to an immenſe height, black, rocky, and marked with rugged ſpiry tops, frequently covered with ſnow. New Georgia may be added as another horribly congenial, riſing detached farther to the eaſt. The mountains about the ſtraits of Magellan ſoar to an amazing height, and infinitely ſuperior to thoſe of the northern hemiſphere, under the ſame degree of latitude. From the north ſide of the Straits of Magellan, they form a continued chain through the kingdoms of Chili and Peru, preſerving a courſe not remote from the Pacific Ocean. The ſummits, in many places, are the higheſt in the world. There are not leſs than 12, which are from 2400 toiſes high to above 3000. Pichincha, which impends over Quito, is about 35 leagues from the ſea; and its ſummit is 2430 toiſes above the ſurface of the water. Cayambé, immediately under the equator, is above 3000; and Chimborazo higher than the laſt by 200. Moſt of them have been volcanic, and in different ages marked with eruptions far more horrible than have been known in other quarters of the globe. They extend from the equator through Chili; in which kingdom is a range of volcanoes, from lat. 26. ſouth, to 45. 30. and poſſibly from thence into Terra del Fuego itſelf; which, forming the Straits of Magellan, may have been rent from the continent by ſome great convulſion, occaſioned by their labourings; and New Georgia forced up from the ſame cauſe. An unparalleled extent of plain appears on their eaſtern ſide. The river of Amazons runs along a level cloathed with foreſts, after it burſts from its confinement at the Pongo of Borjas, till it reaches its ſea-like diſcharge into the Atlantic Ocean.

In the northern hemiſphere, the Andes paſs through the narrow Iſthmus of Darien into the kingdom of Mexico, and preſerve a majeſtic height and their volcanic diſpoſition. The mountain Popocatepec made a violent eruption during the expedition of Cortez, which is moſt beautifully deſcribed by his hiſtorian Antonio de Solis. This, poſſibly, is the ſame with the volcano obſerved by the Abbé d'Auteroche, in his way from Vera Cruz to Mexico; which, from the nakedneſs of the lavas, he conjectured to have been but lately extinguiſhed. From the kingdom of Mexico, this chain is continued northward, and to the eaſt of California; then verges ſo greatly towards the weſt, as to leave a very inconſiderable ſpace between it and the Pacific Ocean; and frequently detached branches jut into the ſea, and form promontories; which, with parts of the chain itſelf, were often ſeen by navigators in the courſe of their voyage. Some branches, as we have before obſerved, extend towards the eaſt, but not to any great diſtance. A plain, rich in woods and ſavannas, ſwarming with biſons or buffaloes, ſtags, and Virginian deer, with bears, and great variety of game, occupies an amazing tract, from the great lakes of Canada, as low as the Gulph of Mexico; and eaſtward to the other great chain of mountains, the Apalachian, which are the Alps of that ſide of northern America. Its commencement is ſuppoſed to be about Lake Champlain and Lake George, with branches pointing obliquely to the river St Laurence eaſtward, and riſing on its oppoſite coaſts; others extending, with lowering progreſs, even into Nova Scotia. The main chain paſſes through the ſtate of New York, where it is diſtinguiſhed by the name of the *Highlands*, and lies within 40 miles of the Atlantic. From thence it recedes from the ſea, in proportion as it advances ſouthward; and near its extremity in South Carolina, is 300 miles diſtant from the water. It conſiſts of ſeveral parallel ridges, divided by moſt enchanting vallies, and generally cloathed with variety of woods. Theſe ridges riſe gradually from the eaſt, one above the other, to the central; from which they gradually fall to the weſt, into the vaſt plains of the Miſſiſippi. The middle ridge is of an enormous bulk and height. The whole extends in breadth about 70 miles; and in many places leaves great chaſms for the diſcharge of the vaſt and numerous rivers which riſe in the boſoms of the mountains, and empty themſelves into the Atlantic Ocean, after yielding a matchleſs navigation to the provinces they water.

Beyond the branch of the Apalachian mountains called *The Endleſs*, is another of amazing extent, nearly as high as the mountains themſelves. This plain (called the *Upper Plains*) is exceedingly rich land; begins at the Mohock's River; reaches to within a ſmall diſtance of Lake Ontario; and to the weſtward forms part of the extenſive plains of the Ohio, and reaches to an unknown diſtance beyond the Miſſiſippi. Vaſt rivers take their riſe, and fall to every point of the compaſs; into Lake Ontario, into Hudſon's River, and into the Delaware and Suſquehanna. The tide of the Hudſon's River flows thro' its deep-worn bed far up, even to within a ſmall diſtance of the head of the Delaware; which, after a furious courſe down a long deſcent, interrupted with rapids, meets the tide not very remote from its diſcharge into the ocean.

ALPUXARRAS, or ALPAXARES, mountains of Spain, in the province of Granada, on the coaſt of the Mediterranean ſea. They are about 17 leagues in length, and 11 in breadth, reaching from the city of Velez to Almeria. They are inhabited by Moors, who are the remains of the diſperſion and ruin of their empire. They embraced the Chriſtian religion; but preſerve their own manner of living, and their language, though much corrupted. Here is a rivulet between Pitros and Portugos, which dyes linen that is dipped in it black in an inſtant. Near this rivulet is a cavern, from which proceeds ſo malignant a ſteam, that it deſtroys ſuch animals as come near it. The Moriſcos cultivate the ſoil extremely well, and plant fruit-trees; ſome of which grow to a prodigious height and thickneſs, and give the mountains a very agreeable aſpect.

ALQUIER, a liquid meaſure, uſed in Portugal to meaſure oil, two of which make an almond. See ALMOND.

ALQUIFOU, or ARQUIFOU, is a ſort of lead-ore, which, when broken, looks like antimony. It is uſed by the potters to give a green varniſh to their works, and thence is called potter's ore. It is met with in Cornwall, &c. The potters mix a ſmall portion of manganeſe with the alquifou, and then the varniſh or glazing on their ware is of a blackiſh hue.

ALREDUS, ALURED, or ALUREDUS, of Beverley, one of the moſt ancient and beſt Engliſh hiſtorians. He wrote in the reign of Henry I. There are no circumſtances of his life known with any degree of certainty. It is generally believed that he was educated at Cambridge, and that he afterwards became one of the canons and treaſurer of St John's at Beverley. And we learn in a note of biſhop Tanner's, that, for the ſake of improvement, he travelled through France and Italy; and that at Rome he became domeſtic chaplain to cardinal Othoboni. He died in the year 1128 or 1129; leaving behind him the following works: 2. *The Annals of Alured of Beverley.* Oxford, 1726. Publiſhed by Mr Hearne, from a manuſcript belonging to Thomas Rawlinſon, Eſq. It contains an abridgment of the hiſtory from Brutus to Henry I. written in good Latin; and with great accuracy. 2. *Libertates eccleſiæ S. Johannis de Beverlac*, &c. a manuſcript in the Cotton library. It is a collection of records relative to the church at Beverley, tranſlated by our author from the Saxon language. The Biographia Britannica evidently proves theſe to be all that were written by Alredus.

ALRESFORD, a town of Hampſhire, ſeated on the road from London to Southampton, cloſe by the river Itching, which feeds a great pond to the left of the town. Part of a Roman highway runs from hence to Alton. It is a rectory, with the mediety of Old Alresford, of L.49 : 12 : 8 in the king's books. It conſiſts of about 200 houſes; has one church; two principal ſtreets, which are large and broad; and a ſmall manufacture of linſeys.

ALSA, a river of Carniola (Pliny), now the *Auſa*; running by Aquileia, with a ſhort courſe from north to ſouth, into the Adriatic; where Conſtantine, the ſon of Conſtantine the Great, fighting againſt Conſtans his brother, loſt his life.

ALSACE, a province of France, bounded on the eaſt by the Rhine, on the South by Swiſſerland, on the weſt by Lorrain, and on the north by the palatinate of the Rhine. It was formerly a part of Germany, but was given to France by the treaty of Munſter. It is one of the moſt fruitful and plentiful provinces of Europe, abounding in corn, wine, wood, flax, tobacco, pulſe, fruits, &c. The mountains which divide it from Lorrain are very high; and generally covered with fir, beech, oak, and horn-beam. Thoſe on the ſide of Swiſſerland are leſs high; and furniſhed with all ſorts of wood, as well for fuel as building. The country itſelf is diverſified with riſing hills and fertile vales, beſides large foreſts; but that between the rivers Ill, Hart, and the Rhine, as far as Straſburgh, is inferior to the reſt, on account of the frequent overflowing of the Rhine. In High Alſace there are mines of ſilver, copper, and lead. They however work none but thoſe of Giromany, from which are annually drawn 1600 marks of ſilver, each mark being eight ounces; and 24,000 pounds of copper: but the expence of working them is almoſt equal to the profit. There are iron-works in ſeveral parts of Alſace, and particularly at Betford. There is a mineral ſpring at Sultſbach, near Munſter, in High Alſace; which is in great reputation for the palſy, weakneſs of the nerves, and the gravel.—The original inhabitants of Alſace are honeſt and good-natured, but wedded to their own manners and cuſtoms. The fruitfulneſs of their country renders them indolent and inactive; for the Swiſs make their hay and reap their corn, as well as manage the vintage of High Alſace, which ſends a great deal of money out of the province. The common language is the German: however, the better ſort of people ſpeak French in the towns; and even in the country, they ſpeak French well enough to be underſtood.

ALSEN, an iſland of Denmark in the leſſer Belt, or entrance into the Baltick ſea, between Sleſwick and Funen. It is remarkable for nothing except two caſtles, and producing large crops of aniſeeds, a carminative much uſed in ſeaſoning the food and mixing with the bread all over the Daniſh dominions. E. Long. 10. 12. N. Lat. 55. 12.

ALSFIELD, a town of Germany, in the landgraviate of Heſſe Caſſel, ten miles north-weſt of Marpurg, and 35 ſouth of Heſſe Caſſel. It is an ancient town, and well-built; and the inhabitants were the firſt of this country who embraced the Reformation. E. Long. 9. 5. N. Lat. 50. 40.

ALSHASH, a very beautiful city in Bukharia, ſuppoſed to be the ſame with that which is now called *Taſhcant*, the capital of the Eaſtern part of Turkeſtan, poſſeſſed by the Kaſſats. It is ſituated on the river *Sihûn*, now *Sîr*, and had a well-watered garden for every houſe; but was ruined by Jenghiz Khan, who took the city, and cauſed a great number of its inhabitants to be maſſacred.

ALSHEDA, a pariſh of Sweden, in the province of Smaland, where a gold mine was diſcovered in 1731.

ALSINA, in botany, a ſynonime of the theligonum. See THELIGONUM.

ALSINASTRUM, in botany, the trivial name and alſo a ſynonime of the elatine. See ELATINE.

ALSINE, or CHICKWEED: A genus of the trigynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 22d order, *Caryophyllei*. The characters are: The *calyx* is quinquephyllous: The *corolla* conſiſts of five equal petals, longer than the calyx: The *ſtamina* conſiſt of five capillary filaments; the antheræ are roundiſh: The *piſtillum* has an oval germen, three filiform ſtyli, and obtuſe ſtigmata: The *pericarpium* is an ovate unilocular capſule, with three valves: The *ſeeds* are roundiſh and numerous. Of this genus a great number of ſpecies are enumerated by ſome botanical writers; but none of them poſſeſs any remarkable properties, except the media, or common chickweed, with white bloſſoms, which is ſo well known as to need no particular deſcription.—This ſpecies affords a notable inſtance of what is called the *ſleep of plants*: for, every night, the leaves approach in pairs, ſo as to include within their upper ſurfaces the tender rudiments of the new ſhoots; and the uppermoſt pair but one at the end of the ſtalk are furniſhed with longer leaf-ſtalks than the others; ſo that they can cloſe upon the terminating pair, and protect the end of the branch. The young ſhoots and leaves, when boiled, can hardly be diſtinguiſhed from ſpring ſpinach. They are deemed refrigerating and nutritive, and an excellent food for perſons of a conſumptive habit of body.—Swine are extremely fond of chickweed; cows and horſes eat it; ſheep are indifferent to it; and goats refuſe it.

ALSIRAT, in the Mahometan theology, denotes a bridge laid over the middle of hell, finer than a hair, and ſharper than the edge of a ſword, over which people are to paſs, after their trial, on the day of judgment. To add to the difficulty of the paſſage, Mahomet aſſures, that the alſirat, narrow as it is, is beſet with briars and thorns; none of which, however, will be any impediment to the good, who ſhall fly over it like the wind; Mahomet and his Muſſulmen lead the way; whereas the wicked, by the narrowneſs of the path, the entangling of the thorns, and extinction of the light which directed the former to paradiſe, will ſoon miſs their footing, and tumble headlong into hell, which is gaping beneath to receive them.

ALSIUM, a city of ancient Etruria, occupying (according to Culverius) the ſpot on which *Pala* now ſtands. We are told by Dionyſius Halicarnaſſenſis, that Alſium was built by the Aborigines, long before the Tyrſenians invaded Italy. In this caſe it muſt have been founded not long after the diſperſion in the days of Peleg. Its founder is ſaid to have been one *Alæſus*, *Aleſus*, or *Aliſa*; whom ſome conjecture to have been Aliſah, or Eliſha, the ſon of Javan, mentioned in ſcripture.

ALSOP (Anthony), a divine and poet, was educated at Weſtminſter-ſchool, and thence elected to Chriſt-church, Oxford, where he took the degree of M. A. in March 1696, and of B. D. in Decem. 1706. On his coming to the univerſity, he was very ſoon diſtinguiſhed by Dean Aldrich, and publiſhed *Fabularum Æſopicarum Delectus*, Oxon, 1698, 8vo. with a poetical dedication to lord viſcount Scudamore, and a preface in which he took part againſt Dr Bently in the famous diſpute with Mr Boyle. He paſſed through the uſual offices in his college to that of cenſor with conſiderable reputation; and for ſome years had the principal noblemen and gentlemen belonging to the ſociety committed to his care. In this employment he continued till his merit recommended him to Sir Jonathan Trelawney, biſhop of Wincheſter, who appointed him his chaplain, and ſoon after gave him a prebend in his own cathedral, together with the rectory of Brightwell in the county of Berks, which afforded him ample proviſion for a learned retirement, from which he could not be drawn by the repeated ſolicitations of thoſe who thought him qualified for a more public character and a higher ſtation. In 1717 an action was brought againſt him by Mrs Elizabeth Aſtrey of Oxford, for a breach of a marriage-contract; and a verdict obtained againſt him for 2000l. which probably occaſioned him to leave the kingdom for ſome time. His death, which happened June 10, 1726, was occaſioned by his falling into a ditch that led to his garden-door. A quarto volume was publiſhed in 1752, under the title of *Antourii Alſopi, Ædis Chriſti olim Alumui Odarum libri duo.* Four Engliſh poems of his are in Dodſley's Collection, one in Pearch's, ſeveral in the early volumes of the Gentleman's Magazine, and ſome in "The Student." Mr Alſop is reſpectfully mentioned by the facetious Dr King of the Commons (vol. I. p. 236), as having enriched the commonwealth of learning, by "Tranſlations of Fables from Greek, Hebrew, and Arabic;" and not leſs detractingly by Dr Bentley, under the name of "Tony Alſop, a late editor of the Æſopean Fables."

Alsop (Vincent), an eminent divine, was educated in St John's college in Cambridge, where he took the degree of Maſter of Arts. He received deacon's orders from a biſhop, after which he went down into Rutlandſhire, and ſettled at Oakham, where he was an aſſiſtant to the maſter of the free-ſchool. As he was a man of a ſprightly turn, he fell there into indifferent company; but was reclaimed by the frequent admonitions of the reverend Mr Benjamin King. He afterwards married that gentleman's daughter, and becoming a convert to his principles, received ordination in the Preſbyterian way, not being ſatisfied with that which he had from the biſhop. He was ſettled at Wilbee in the county of Northampton, whence he was ejected in 1662, for nonconformity. After this he ventured to preach ſometimes at Oakham, and at Wellingborough where he lived, and was once ſix months in priſon for praying by a ſick perſon. A book he wrote againſt Dr Sherlock in a humorous ſtyle, made him well known to the world, and induced Mr Cawton, an eminent nonconformiſt in Weſtminſter, to recommend him to his congregation for his ſucceſſor. On receiving this call, he quitted Northamptonſhire and came to London, where he preached conſtantly, and wrote ſeveral pieces which were extremely well received by the public. His living in the neighbourhood of the court expoſed him to many inconveniences; but theſe ended with the reign of Charles II. or at leaſt in the beginning of the next reign, when Mr Alſop's ſon engaging in treaſonable practices was freely pardoned by king James. After this our divine went frequently to court, and is generally ſuppoſed to have been the perſon who drew the Preſbyterian's addreſs to that prince for his general indulgence. After the Revolution, Mr Alſop gave very public teſtimonies of his affection for the government; yet upon all occaſions he ſpoke very reſpectfully of king James, and retained a very high ſenſe of his clemency in ſparing his only ſon. The remainder of his life he ſpent in the exerciſe of his miniſtry, preaching once every Lord's day; beſides which he had a Thurſday lecture, and was one of the lecturers at Pinner's hall. He lived to be a very old man, and preſerved his ſpirits to the laſt. On grave ſubjects he wrote with a becoming ſeriouſneſs; but where wit might properly be ſhown, he diſplayed his to great advantage. His funeral ſermon was preached by Mr Slater, and his memory will be always preſerved by his own learned and elegant writings. Of theſe the moſt remarkable, beſides his ſermons, are, 1. *Antiſozzo;* in vindication of ſome great truths oppoſed by Dr William Sherlock, 8vo, 1675. 2. *Melius Inquirendum;* in anſwer to Dr Goodman's Compaſſionate Inquiry, 8vo, 1679. 3. The Miſchief of Impoſitions; in anſwer to Dr Stillingfleet's Miſchief of Separation, 1680. 4. A Faithful Reproof to a falſe Report, with reference to to the Differences among the United Miniſters in London, 8vo.

ALSTEDIUS (John Henry), a German Proteſtant divine, and one of the moſt indefatigable writers of the 17th century. He was ſome time profeſſor of philoſophy and divinity at Herborn in the county of Naſſau: from thence he went into Tranſylvania, to be profeſſor at Alba Julia; where he continued till his death, which happened in 1638, being then 50 years of age. His *Encyclopedia* has been much eſteemed even by the Roman Catholics; it was printed at Lyons, and ſold very well throughout all France. His *Theſaurus Chronologicus* is by ſome eſteemed one of his beſt works, and has gone through ſeveral editions. He alſo wrote *Triumphus Biblicus,* to ſhow that the principles of all arts and ſciences are to be found in the Scriptures; but he gained very few to his opinion. He was a Millenarian; and publiſhed, in 1627, a treatiſe *De mille annis,* in which he aſſerted that the reign of the ſaints on earth was to begin in 1694.

ALSTON-MORE, a town in Cumberland, ſeated on a hill, at the bottom of which runs the river Tyne, with a ſtone bridge over it. Near this place is plenty of lead-ore. W. Long. 2. 4. N. Lat. 54. 45.

ALSTONIA, in botany; a genus of the monogynia order, belonging to the hexandria claſs of plants. The characters are: The *calyx* is a perianthium beneath, imbricated: The *corolla* is monopetalous, and ſhorter than the calyx; the border expanding, eight or ten parted, with alternate diviſions: The *ſtamina* conſiſt of numerous ſhort filaments, the exterior ones longer; the antheræ are orbicular and furrowed: The *piſtillum* has a ſmall ovate gemen above; a ſimple ſtylus the length of the corolla, filiform and erect; the ſtigma inverſe egg-headed. There is but one ſpecies, the theaformis, a native of America.

ALSTROEMERIA, in botany: A genus of the monogynia order belonging to the hexandria claſs of plants; and, in the natural method, ranking under the 11th order, *Sarmentaceæ.* The characters are: There is no *calyx:* The *corolla* is nearly bilabiated; and conſiſts of ſix petals, the two inferior tubular at the baſe: The *ſtamina* conſiſt of ſix ſubulated filaments, declining and unequal; the antheræ oblong: The *piſtillum* has an hexangular germen beneath; the ſtylus declining, filiform, the length of the ſtamina; and three oblong bifid ſtigmata: The *pericarpium* is a roundiſh hexangular capſule, with three cells and three valves: The *ſeeds* are globular and numerous. There are five ſpecies, natives of Italy and Peru.

ALT, in muſic, a term applied to the high notes in the ſcale.

ALTAIC Chain, a range of mountains which bounds Aſia on the ſouth. It begins at the vaſt mountain Bogdo, paſſes above the head of the Irtiſch, and then takes a courſe rugged, precipitous, clothed with ſnow, and rich in minerals, between the Irtiſch and Ob-

Ob; then proceeds by the lake Telezkoi, the riſe of the Ob; after which it retires in order to comprehend the great rivers which form the Jeneſei, and are locked up in theſe high mountains; finally, under the name of the *Sainnes*, is uninterruptedly continued to the lake of Baikal. A branch inſinuates itſelf between the ſources of the rivers Onon and Ingoda, and thoſe of Ichikoi, accompanied with very high mountains, running without interruption to the north-eaſt, and dividing the river of Amur, which diſcharges itſelf into the eaſt, in the Chineſe dominions, from the river Lena and lake Baikal. Another branch ſtretches along the Olecma, croſſes the Lena below Jakoutſk, and is continued between the two rivers Tongouſka to the Jeneſei, where it is loſt in wooded and moraſſy plains. The principal chain, rugged with ſharp-pointed rocks, approaches and keeps near the ſhores of the ſea of Ockhotz, and paſſing by the ſources of the river Outh, Alden, and Maia, is diſtributed in ſmall branches, which range between the eaſtern rivers which fall into the Icy Sea; beſides two principal branches, one of which, turning ſouth, runs through all Kamtſchatka, and is broken, from the cape Lopatka, into the numerous Kurile iſles, and to the eaſt forms another marine chain, in the iſlands which range from Kamtſchatka to America; moſt of them, as well as Kamtſchatka itſelf, diſtinguiſhed by fierce volcanoes, or the traces of volcanic fires. The laſt chain forms chiefly the great cape Tſchutſki, with its promontories and rocky broken ſhores.

ALTAMONT, a very handſome town of Italy, in the kingdom of Naples, and in Calabria Citerior, 15 miles north-weſt of Baſigniano. E. Long. 16. 22. N. Lat. 30. 40.

ALTAMURA, a town of Naples, in the territory of Bari, with the title of a principality, ſeated on the foot of the Apennine mountains. E. Long. 16. 54. N. Lat. 41. 0.

ALTAR, a place upon which ſacrifices were anciently offered to ſome deity.

The heathens at firſt made their altars only of turf; afterwards they were made of ſtone, of marble, of wood, and even of horn, as that of Apollo in Delos.

Altars differed in figure as well as in materials. Some were round, others ſquare, and others triangular. All of them were turned towards the eaſt, and ſtood lower than the ſtatues of the gods; and were generally adorned with ſculpture, repreſenting either the gods to whom they were erected, or their ſymbols. See the PAGAN ALTARS repreſented on Plate XIII. Upon the ſides of N°. 1. a trident and two dolphins are exhibited, which denote it to have been dedicated to Neptune. N° 2. a four-ſquare altar, was dedicated to the nymphs, as the inſcription imports. N° 3. exhibits a Bacchanal holding a thyrſus in his hand, a mark of the altar's being built to Bacchus: it had two other ſides, which made it appear triangular. Of N° 4. which was alſo triangular, each face or ſide exhibited a genius, one of whom (on the ſide repreſented) carries an oar upon his neck, which ſeems to denote it an altar of Neptune. N° 5. an altar of a round ſhape, is inſcribed *Ara Neptuni*: the god himſelf is there repreſented, all naked, ſaving the pallium upon his ſhoulder; and holding in his left hand a trident, and in his right a dolphin.

The height of altars alſo differed according to the different gods to whom they ſacrificed. According to Servius, thoſe altars ſet apart for the honour of the celeſtial gods, and gods of the higher claſs, were placed on ſome pretty tall pile of building; and for that reaſon were called *altaria*, from the words *alta* and *ara*, "a high elevated altar." Thoſe appointed for the terreſtrial gods were laid on the ſurface of the earth, and called *aræ*. And, on the contrary, they dug into the earth and opened a pit for thoſe of the infernal gods, which they called βοθροι λακκοι, "ſcrobiculi." But this diſtinction is not every where obſerved: the beſt authors frequently uſe *ara* as a general word, under which are included the altars of the celeſtial and infernal, as well as thoſe of the terreſtrial, gods. Witneſs Virgil, Ecl. 5.

> —— *En quatuor aras.*

Where *aræ* plainly includes *altaria*; for, whatever we make of Daphnis, Phœbus was certainly a celeſtial god. So Cicero, pro Quint. *Aras delubraque Hecates in Græcia vidimus.* The Greeks alſo diſtinguiſhed two ſorts of altars; that whereon they ſacrificed to the gods was called βωμος, and was a real altar, different from the others whereon they ſacrificed to the heroes, which was ſmaller, and called εσχαρα. Pollux makes this diſtinction of altars in his Onomaſticon; he adds, however, that ſome poets uſed the word εσχαρα for the altar whereon ſacrifice was offered to the gods. The Septuagint verſion does ſometimes alſo uſe the word εσχαρα for a ſort of little low altar, which may be expreſſed in Latin by *craticula*; being a hearth rather than an altar.

Before temples were in uſe, altars were erected ſometimes in groves, ſometimes in the highways, and ſometimes on the tops of mountains; and it was a cuſtom to engrave upon them the name, enſign, or character, of the deity to whom they were conſecrated.

In the great temples of ancient Rome there were ordinarily three altars: The firſt was placed in the ſanctuary, at the foot of the ſtatue of the divinity, upon which incenſe was burnt and libations offered; the ſecond was before the gate of the temple, and upon it they ſacrificed the victims; and the third was a portable altar, upon which was placed the offering and the ſacred veſſels.

Beſides theſe uſes of altars, the ancients ſwore upon them, and ſwore by them, in making alliances, confirming treaties of peace, and other ſolemn occaſions. Altars alſo ſerved as places of refuge to all thoſe who fled to them, whatever crime they had committed.

Altars are doubtleſs as ancient as ſacrifices themſelves; conſequently their origin is not much later than that of the world; Gen. ch. iv. Some attribute their origin to the Egyptians; others to the Jews; others to the patriarchs before the flood. Some carry them as far back as Adam, whoſe altar is much ſpoken of by Jewiſh, and even Chriſtian writers. Others are contented to make the patriarch Enoch the firſt who conſecrated a public altar. Be this as it will, the earlieſt altars we find any expreſs teſtimony of are thoſe erected by Abraham.

Altars, in the patriarchal times, were very rude. The altar which Jacob ſet up at Beth-el was nothing but a ſtone, which ſerved him inſtead of a bolſter; that of Gideon, a ſtone before his houſe: and the firſt which

God commanded Moſes to erect was probably of earth, or unpoliſhed ſtones, without any iron; for if any uſe was made of that metal, the altar was declared impure.

The principal altars of the Jews were, The altar of *incenſe*; that of *burnt-offering*; and the *altar*, or *table, for the ſhew-bread*.

The *altar of incenſe* was a ſmall table of ſhittim-wood, covered with plates of gold, of one cubit in length, another in width, and two in height. At the four corners, were four kinds of horns, and all round a little border or crown over it. This was the altar hidden by Jeremiah before the captivity; and upon it the officiating prieſt offered, every morning and evening, incenſe of a particular compoſition. See Plate XIII.

The *altar of burnt-offerings* was made of ſhittim-wood, and carried upon the ſhoulders of the prieſts by ſtaves of the ſame wood overlaid with braſs. In the time of Moſes, this altar was five cubits ſquare and three high; but in Solomon's temple it was much larger, being 20 cubits ſquare and 10 in height. It was covered with braſs; and at each corner was a horn or ſpire, wrought out of the ſame wood with the altar, to which the ſacrifices were tied. Within the hollow was a grate of braſs, on which the fire was made; through it fell the aſhes, and were received in a pan below. At the four corners of the grate were four rings and four chains, which kept it up at the horns. This altar was placed in the open air, that the ſmoke of the burnt-offerings might not ſully the inſide of the tabernacle. See Plate XIII.

The *altar*, or *table*, for the *ſhew-bread*, was likewiſe of ſhittim-wood, covered with plates of gold, having a little border round it, adorned with ſculpture. It was two cubits long, one wide, and one and an half in height. Upon this table, which ſtood in the holy of holies, were put, every ſabbath-day, 12 loaves, with ſalt and incenſe.

The Jewiſh altars, after their return from the captivity, and the building of the ſecond temple, were in ſome reſpects different from thoſe deſcribed above. That of burnt-offerings was a large pile, built of unhewn ſtone, 32 cubits ſquare at the bottom, and 24 ſquare at the top. The aſcent was by a gentle riſing, 32 cubits in length, and 16 in breadth.

ALTAR, is alſo uſed among Chriſtians for the Communion-table.

In the primitive church, the altars were only of wood; as being frequently to be removed from place to place. But the council of Paris, in 509, decreed that no altar ſhould be built but of ſtone.—At firſt there was but one altar in each church; but the number ſoon increaſed; and from the writings of Gregory the Great, who lived in the ſixth century, we learn, that there were ſometimes in the ſame church 12 or 13. In the cathedral of Magdeburg there are no leſs than 49 altars.

The altar is ſometimes ſuſtained on a ſingle column, as in the ſubterraneous chapels of St Cecilia, at Rome, &c.; and ſometimes by four columns, as the altar of St Sebaſtian of Crypta Arenaria; but the cuſtomary form is, to be a maſſive of ſtone-work, ſuſtaining the altar-table. Theſe altars bear a reſemblance to tombs: to this purpoſe, we read in church-hiſtory, that the primitive Chriſtians chiefly held their meetings at the tombs of the martyrs, and celebrated the myſteries of religion upon them; for which reaſon, it is a ſtanding rule to this day in the church of Rome, never to build an altar, without incloſing the relics of ſome ſaint in it.

ALTAR-THANE, or ALTARIST, in old law-books, an appellation given to the prieſt or parſon of a pariſh, to whom the altarage belonged. See ALTARAGE.

ALTARAGE, in law, altars erected in virtue of donations, before the Reformation, within a parochial church, for the purpoſe of ſinging a maſs for deceaſed friends.

ALTARAGE likewiſe ſignifies the profits ariſing to the prieſt on account of the altar.

AL-TAYEFF, a town of Hajaz, a diſtrict of Arabia Felix. It is ſituated about 60 miles eaſt of Mecca, behind mount Gazwan, where the cold is more intenſe than in any other part of the diſtrict, but the air very wholeſome. Its territory abounds in fountains, and produces excellent raiſins. The town is ſurrounded with a wall, but is not very large.

ALTDORF, a large handſome town in Swiſſerland, and the chief of the canton of Uri. It is ſituated below the lake of the four cantons, in a plain, at the foot of a mountain, whoſe paſſages are difficult, and ſerve inſtead of fortifications. It has four churches and two convents; St Martin's church and that of the Holy Croſs are the fineſt. The town-houſe and the arſenal are alſo worth ſeeing. E. Long. 8. 30. N. Lat. 46. 50.

ALTEA, a ſea-port town of Valencia, in Spain. It was taken in 1705, in favour of the archduke Charles; but loſt after the battle of Almanza. W. Long. 0. 15. N. Lat. 46. 34.

ALTEMBURG, a town of Tranſylvania, 17 miles S. W. of Wiſemburg, and 35 S. of Clauſenburg. E. Long. 23. 5. N. Lat. 46. 25.

ALTENA, a ſea-port town of Germany, in the duchy of Holſtein, in Lower Saxony. It is a modern town, built by the king of Denmark, and was burnt by the Swedes in 1712; but has ſince been beautifully re-built. The merchandiſe brought from Aſia, by the Daniſh Eaſt-India company, is ſold here. E. Long. 10. 0. N. Lat. 53. 51.

ALTENBERG, an ancient town of Germany ſituated on the river Pleiſs, with a good caſtle placed on a rock, in Miſnia, in the circle of the Upper Saxony. It was formerly an imperial city, but at preſent belongs to the houſe of Saxony. Here is a college which has always been in a flouriſhing condition. In 1705, there was a nunnery founded for women of a high rank, who are Proteſtants. E. Long. 15. 8. N. Lat. 50. 59.

ALTENBURG, a ſmall fortified town of Hungary, in the territory of Moſon, near the Danube, about 55 miles from Vienna. E. Long. 35. 30. N. Lat. 48. 15.

ALTENBURG, or OWAR, a ſmall but ſtrong town of Hungary, ſeated in a marſh, with wide ſtreets. It is near the river Danube, and is ſurrounded with deep ditches. It is 15 miles ſouth of Preſburg, 40 ſouth-eaſt of Vienna, and 65 ſouth-weſt of Buda. E. Long. 17. 56. N. Lat. 44. 0.

ALTERANTS, or *Alterative Medicines*, ſuch as correct the bad qualities of the blood and other humours, without occaſioning any ſenſible evacuation.

ALTERATION, in phyſics, the acts of changing the circumſtances and manner of a thing ; its general nature and appearance remaining the ſame. Or, it is an accidental and partial change in a body ; without proceeding ſo far as to make the ſubject quite unknown, or to take a new denomination thereupon.—Or, it may be defined, the acquiſition or loſs of ſuch qualities as are not eſſential to the form of the body. Thus, a piece of iron, which before was cold, is ſaid to be *altered*, when it is made hot ; ſince it may ſtill be perceived to be iron, is called by that name, and has all the properties thereof. By this *alteration* is diſtinguiſhed from *generation* and *corruption ;* thoſe terms expreſſing an acquiſition or loſs of the eſſential qualities of a thing — The modern philoſophers, after the ancient chemiſts and corpuſcularians, hold all *alteration* to be effected by means of local motion. According to them, it always conſiſts either in the emiſſion, acceſſion, union, ſeparation, or tranſpoſition, of the component particles.

ALTERCATION, a debate or conteſt between two friends or acquaintance. The word comes from *altercari*, which anciently ſignified to converſe or hold diſcourſe together.—Thus, we ſay, They never come to an open quarrel, but there is continually ſome little *altercation* or other.

ALTERN-base, in trigonometry, a term uſed in contradiſtinction to the true baſe. Thus in oblique triangles, the true baſe is either the ſum of the ſides, and then the *difference* of the ſides is called the *altern-baſe ;* or the true baſe is the difference of the ſides, and then the *ſum* of the ſides is called the *altern-baſe*.

ALTERNATE, in a general ſenſe, a term applied to ſuch perſons or things as ſucceed each other by turns. Thus, two who command each his day, are ſaid to have an alternate command, or to command alternately.

Alternate, in heraldry, is ſaid in reſpect of the ſituation of the quarters. Thus the firſt and fourth quarters, and the ſecond and third, are uſually of the ſame nature, and are called *alternate quarters*.

Alternate, in botany, when the leaves or branches of plants ariſe higher on oppoſite ſides alternately.

ALTERNATION, in its primary ſenſe, denotes a ſucceſſion by turns.

Alternation is ſometimes uſed to expreſs the different changes or alterations of orders in any number of things propoſed. This is alſo called *permutation*, &c. and is eaſily found by a continual multiplication of all the numbers, beginning at unity. Thus, if it be required to know how many changes or alternations can be rung on ſix bells, multiply the numbers 1, 2, 3, 4, 5, 6, continually into one another ; and the laſt product gives the number of changes.

ALTERNATIVE, is particularly uſed for the choice of two things propoſed. In this ſenſe we ſay, to take the *alternative* of two propoſitions.

ALTHÆA, Marshmallow : A genus of the polyandria order, belonging to the monodelphia claſs of plants ; and, in the natural method, ranking under the 37th order, *Columniferæ*. The characters are : The *calyx* is a double perianthium, the exterior one nine-cleft : The *corolla* conſiſts of five petals, coaleſced at the baſe : The *ſtamina* conſiſt of numerous filaments inſerted into the corolla ; the antheræ are kidney-ſhaped. The *piſtillum* has an orbicular germen ; a ſhort cylindrical ſtylus ; and numerous briſtly ſtigmata, the length of the ſtylus : The *pericarpium* conſiſt of numerous arillæ : The *ſeeds* are ſolitary, and kidney-ſhaped. There are three

Species. 1. The vulgaris, or common marſhmallow, is a native of Britain, and hath a perennial root, and an annual ſtalk, which periſhes every autumn. The ſtalks grow erect to the height of four or five feet. Theſe are garniſhed with leaves which are hoary, ſoft to the touch, and placed alternately on the branches. The flowers come out from under the wings of the leaves, like the mallow, and are of a purpliſh white. 2. The hirſuta, or hairy marſhmallow, is a native of Spain and Portugal. It is a low plant, whoſe branches trail on the ground, unleſs they are ſupported by ſtakes. The leaves and ſtalks are beſet with ſtrong hairs, the flowers come out like thoſe of the common ſort, but are ſmaller, and have purpliſh bottoms. 3. The cannabina, or ſhrubby marſhmallow, is a native of Hungary and Iſtria. It has a woody ſtem, which riſes to the height of four or five feet ; and puts out many ſide-branches. The flowers come out in the ſame manner as in the others, but are of a deeper red colour. This ſort ſeldom flowers the firſt year, unleſs the ſummer proves warm ; but when the plants live through the winter, they will flower early in the following ſummer, and produce good ſeeds.

Culture. Though the firſt ſort is found naturally in ſalt marſhes, it will thrive when tranſplanted into any ſoil, or in any ſituation ; however, it will always grow larger in moiſt than in dry ſoil. It may be propagated either by parting the roots in autumn when the ſtalks decay, or by ſowing the ſeeds in the ſpring. If the ſeeds of the ſecond ſpecies are ſown in April, the plants will flower in July, and carry ripe ſeed in September. They ought to be ſown in the places where they are to remain, as the roots ſhoot deep in the ground ; ſo that unleſs the plants are removed very young, they ſeldom ſurvive it. The ſeeds of the cannabina ought alſo to be ſown where the plants are to remain, for the reaſon juſt now given. They ſhould have a ſheltered ſituation and dry ſoil, otherwiſe they will not live through the winter. Indeed they ſeldom continue in Britain above two years, with all the care that can be taken of them.

Medicinal Uſes. The firſt is the only ſpecies uſed in medicine. The whole plant, eſpecially the root, abounds with a mild mucilage. It has the general virtues of an emollient medicine ; and proves ſerviceable in a thin acrimonious ſtate of the juices, and where the natural mucus of the inteſtines is abraded. It is chiefly recommended in ſharp defluxions upon the lungs, hoarſeneſs, dyſenteries ; and likewiſe in nephritic and calculous complaints : not, as ſome have ſuppoſed, that this medicine has any peculiar power of diſſolving or expelling the calculus ; but as, by lubricating and relaxing the veſſels, it procures a more free and eaſy paſſage. The root is ſometimes employed externally for ſoftening and maturating hard tumours ; chewed, it is ſaid to give eaſe in difficult dentition of children.

This root gave name to an officinal ſyrup, decoction, and ointment; and was likewiſe an ingredient in the compound powder of gum tragacanth and the oil and plaſter of mucilages. But of all theſe formulæ the ſyrup alone is now retained.

ALTHÆA Frutex. See HIBISCUS.

ALTIMETRY, the art of meaſuring altitudes or heights, whether acceſſible or inacceſſible. See GEOMETRY.

ALTIN, a money of account in Muſcovy, worth three *copecs*; one hundred of which make a ruble, worth about 4s. 6d. ſterling.

ALTIN, a lake in Siberia, from whence iſſues the river Ob, or Oby, in N. Lat. 52. 0. E. Long. 85°. 55. This lake is called by the Ruſſians *Teloſkoi Oſero*, from the Teleſſi, a Tartarian nation, who inhabit the borders of it, and who give it the name of *Altin-Kul.* By the Calmucks it is called *Altinnor.* It is near ninety miles long and 50 broad, with a rocky bottom. The north part of it is ſometimes frozen ſo hard as to be paſſable on foot, but the ſouthern part is never covered with ice. The water in the Altin lake, as well as in the rivers which run through the adjacent places, only riſes in the middle of ſummer, when the ſnows on the mountains are melted by the heat of the ſun.

ALTINCAR, among mineraliſts, a ſpecies of factitious ſalt uſed in the fuſion and purification of metals.

The altincar is a ſort of flux powder. Divers ways of preparing it are given by Libavius.

ALTING (Henry), profeſſor of divinity at Heidelberg and Groningen, was born at Embden in 1583, of a family which had been long conſpicuous in Friſeland. His father, Menſo Alting, was the firſt, who, with two others, preached the reformation in the territory of Groningen, about the year 1566, under the tyrannical government of the duke of Alva; and the firſt that preached in the great church of Groningen, after the reduction of that town by the States General in 1594. Henry was choſen, in 1605, preceptor to the three young counts of Naſſau, Solms, and Izenberg. After various difficulties, he ſettled at Groningen, where he continued till his death, Auguſt 25. 1644. He was a ſound proteſtant divine, a pious Chriſtian, a uſeful member of ſociety in many reſpects, and one who ſuffered much for the truth. Moſt of his works were never publiſhed; thoſe which have been are the following: *Notæ in decadem problematum J. Behm.* 1618. *Loci communes explicatio catecheſeos Palatinæ*, 1646, in 3 vols. *Exegeſis Auguſtanæ confeſ.* 1647. *Methodus theologiæ*, 1650. It appears from the catalogue of his works annexed to his life, that the *Medulla hiſt. prophanæ*, publiſhed by Dr Pareus, was compoſed by Alting. The moſt remarkable piece among Alting's MS. is, The eccleſiaſtical hiſtory of the Palatinate, from the reformation to the adminiſtration of John Caſimir.

ALTING (James), ſon of the former, was born at Heidelberg in 1618. He travelled into England in 1640, where he was ordained by the learned Dr Prideaux, biſhop of Worceſter. He afterwards accepted of the profeſſorſhip of Groningen, vacant by the death of Gomarus; but his ſituation was rendered very diſagreeable by the continual diſputes which he had with his colleague Sam. des Marets, who favoured the ſchool-divinity. He died in 1697. He recommended the edition of his works to Menſo Alting (author of *Notitia German. Infer. Antiquæ*, fol. Amſt. 1679); but they were publiſhed in 5 vols. folio, with his life, by Mr Bekker of Amſterdam. They contain various analytical, exegetical, practical, problematical, and philoſophical tracts, which ſhow his great induſtry and knowledge. Alting was a divine greatly addicted to the text of the ſcripture, to Cocceianiſm, and Rabbiniſm. He preached well in German, Dutch, and Engliſh.

ALTITUDE, acceſſible, and inacceſſible. See GEOMETRY.

The method of taking conſiderable terreſtrial altitudes, of which thoſe of mountains are the greateſt, by means of the barometer, is very eaſy and expeditious. It is done by obſerving, on the top of the mountain, how much the mercury has fallen below what it was at the foot of the mountain. See BAROMETER.

ALTITUDE of the Eye, in perſpective, is a right line let fall from the eye, perpendicular to the geometrical plane.

ALTITUDE, in aſtronomy, is the diſtance of a ſtar, or other point, in the mundane ſphere, from the horizon.

This altitude may be either *true* or *apparent.*—If it be taken from the rational or real horizon, the altitude is ſaid to be true or real; if from the apparent or ſenſible horizon, the altitude is apparent.—Or rather, the apparent altitude is ſuch as it appears to our obſervation; and the *true* is that from which the refraction has been ſubtracted.

The true altitudes of the ſun, fixed ſtars, and planets, differ but very little from their apparent altitudes; becauſe of their great diſtance from the centre of the earth, and the ſmallneſs of the earth's ſemidiameter, when compared thereto. But the difference between the true and apparent altitude of the moon is about 52. This ſubject is further explained under ASTRONOMY.

ALTITUDE Inſtrument, or *Equal Altitude Inſtrument*, is that uſed to obſerve a celeſtial object when it has the ſame altitude on the eaſt and weſt ſides of the meridian. See ASTRONOMY, the laſt ſection.

ALTKIRK, a town of Alſace in Germany, ſituated on the river Ill, in N. Lat. 47. 40. and E. Long. 7. 15.

ALTMORE, a town of Ireland, in the county of Tyrone, and province of Ulſter, ſituated in N. Lat. 54. 34. and W. Long. 7. 2.

ALTON, a town in Hampſhire, ſeated on the river Wey; W. Long. 0. 46. N. Lat. 51. 5. It is governed by a conſtable; and conſiſts of about 300 houſes, indifferently built, chiefly laid out in one pretty broad ſtreet. It has one church, a Preſbyterian, and a Quaker meeting, a famous free ſchool, a large manufacture of plaid and figured baragons, ribbed druggets, and ſerges de Niſmes; and round the town is a large plantation of hops.

ALTON, or AVELTON, a village in Staffordſhire, five miles north of Utoxeter. There are the ruins of a caſtle here, which ſome would have to be built before the Norman conqueſt; but Dr Plott is pretty certain that it was erected by Theobald de Verdum, in the beginning of the reign of Edward II. A great part of the walls are ſtill ſtanding, but they are in a very ruinous condition.

ALTO *et BASSO*, or *in ALTO & in BASSO*, in law, ſignifies the abſolute reference of all differences, ſmall and great, high and low, to ſome arbitrator or indifferent perſon.—*Fateat univerſis per præſentes, quod Willielmus Tylar de Yetton, & Thomas Gower de A.meſtre, poſuerunt ſe in* Alto *& in* Baſſo, *in arbitrio quatuor hominum;* viz. *de quadam querela pendente inter eos in curia.—Nos & terram noſtram* altè & baſſè *ipſius domini Regis ſuppoſuimus voluntati.*

Alto-Relievo. See Relievo.

Alto-Ripieno, in muſic, the tenor of the great chorus which ſings and plays only now and then in ſome particular places.

ALTORF, a town of the circle of Franconia, in Germany. It has a phyſic garden, with 2000 different plants; a theatre for diſſections, which has many curioſities in the anatomical way; and a handſome library. It is ſubject to the houſe of Brandenburgh; and is ſeated on the confines of Bavaria, 15 miles from Nuremberg. E. Long. 9. 35. N. Lat. 47. 46.

ALT-RANSTADT, a town in Saxony, famous for the treaty between Charles XII. king of Sweden and Auguſtus elector of Saxony, in 1706, wherein the latter reſigned the kingdom of Poland.

ALTRINGHAM, a town of Cheſhire in England, upon the borders of Lancaſhire, ſeven miles from Mancheſter. W. Long. 1. 30. N. Lat. 53. 25.

ALTZEG, a town of Germany in the Lower Palatinate, the capital of a territory of the ſame name, with an old caſtle. W. Long. 7. 25. N. Lat. 49. 44.

ALVA de Tormes, a conſiderable town in Spain, in the kingdom of Leon, and territory of Salamanca, with a very handſome caſtle. It is ſeated on the north bank of the river Tormes. W. Long. 6. 1. N. Lat. 41. 0.

ALVAH, the wood wherewith Moſes ſweetened the waters of Marah, Exod. ch. xv. ver. 25.—The name of this wood is not found in ſcripture; but the Mahometans give it that of *alvah,* and pretend to trace its hiſtory from the patriarchs before the flood. Joſephus, on the contrary, ſays, that Moſes uſed the wood which he found next lying before him.

ALVARES de luna, or as ſome call him Alvaro, is a character too edifying to be omitted in this work. He was the favourite of John II. king of Caſtile: was famous for the prodigious aſcendancy he gained over this prince, and for the puniſhment which at length overtook him. He was natural ſon of Don Alvaro de Luna, Lord of Canete in Arragon, and of a woman infamous for unbounded luſt. He was born in 1388, and named Peter; but Anti-Pope Benedict XIII. who was charmed with his wit tho' yet a child, changed Peter to Alvares. He was introduced to court in 1408, and made a gentleman of the bedchamber to king John, with whom he grew into the higheſt favour. In 1427 he was obliged to retire: the courtiers exerted all their endeavours to ruin him: they complained, that a man of no military ſkill, of no virtues whatever, ſhould, by mere artifice and diſſimulation, be advanced to the higheſt authority; and they could not bear that, by the aſſiſtance of a few upſtart men, whom he had raiſed and fixed to his intereſt, he ſhould reign as abſolutely as if he were king.

They prevailed againſt him, and Alvares was baniſhed from court a year and an half: but this was the greateſt affliction imaginable to the king; who ſhowed all marks of diſtreſs the moment he was removed from his preſence, and now thought and ſpoke of nothing but Alvares. He was therefore recalled; and, being inveſted with his uſual authority, revenged himſelf ſeverely upon his enemies, by perſuading the king to baniſh them. Of the 45 years he ſpent at court, he enjoyed for thirty of them ſo entire an aſcendancy over the king, that nothing could be done without his expreſs orders: nay, it is related by Mariana, that the king could not change an officer or ſervant, or even his clothes or diet, without the approbation of Alvares. In ſhort, he wanted nothing to complete his grandeur but the name of king: he had all the places in the kingdom at his diſpoſal; he was maſter of the treaſury, and by bounties had ſo gained the hearts of the ſubjects, that the king, though his eyes now were opened, and his affections ſufficiently turned againſt him, durſt not complain.

But the day of reckoning was approaching, and at length he was ſeized; yet not directly, openly, and violently, but with ſome of that management which upon a ſimilar occaſion was formerly employed by Tiberius againſt Sejanus. During his confinement, he made ſeveral attempts to ſpeak to the king in perſon; but not being able to effect this, he ſent the following letter, from which, as well as from the reſt of Alvares's hiſtory, all court favourites may draw abundant matter for edification and inſtruction. “Sir, it is five “and forty years ſince I was admitted into your ſer“vice. I do not complain of the rewards I have re“ceived: they were greater than my merits or expec“tation, as I ſhall not deny. There was but one “thing wanted to complete my happineſs; and that “was to have fixed proper limits in time to this great “fortune of mine. While, inſtead of chooſing retire“ment, after the example of the greateſt men, I ſtill “continued in the employment, which I thought not “only my duty, but neceſſary for your intereſt, I fell “into this misfortune. It is very hard that I ſhould “be deprived of liberty, when I have riſked life and “fortune more than once to reſtore it to you. Grief “prevents me from ſaying more. I know that the “Deity is provoked againſt me by my ſins; but it will “be ſufficient for me, if his anger is appeaſed by the “calamities I now ſuffer. I can no longer bear the “prodigious maſs of riches, which it was wrong in “me to have heaped together. I ſhould willingly “reſign them, but that every thing I have is in your “power; and I am denied the opportunity of ſhowing “mankind, that you have raiſed a perſon to the height “of greatneſs, who can contemn wealth as well as pro“cure it, and give it back to him from whom he re“ceived it. But I deſire you in the ſtrongeſt terms, “that, as I was obliged by the lowneſs of the trea“ſury to raiſe 10,000 or 12,000 crowns by methods “I ought not to have taken, you will reſtore them to “the perſons from whom they were extorted. If you “will not grant this on account of the ſervices I have “done, yet I think it neceſſary to be done from the “reaſon of the thing.”

This letter, however, produced no effect in his favour: Alvares was tried, and condemned to loſe his head. After condemnation, he was removed to Valladolid; and, having confeſſed himſelf, and received the ſacrament, he was carried upon a mule to the market place, in the middle of which a large ſcaffold was erected. Mounting the ſcaffold he paid reverence to the croſs, and preſently gave his hat and ſignet to his page, ſaying, "Theſe are the laſt gifts you will ever receive "from me." He then ſubmitted himſelf to the axe with the utmoſt intrepidity. Dr Geddes relates, that he was executed the 4th of June, others the 5th of July, 1453.

ALUDELS, in chemiſtry, are earthen pots without bottoms, inſerted into each other, and uſed in ſublimations.

ALVEARIUM, in anatomy, the bottom of the *concha*, or hollow of the outer ear.

Alvearium alſo ſignifies a bee-hive. The word is formed of *alveus*, a "channel or cavity;" in alluſion to the *alveoli*, or cells in bee-hives.

Some of the ancients uſed alſo the word *alvearium* for a bee-houſe, more uſually called among us *apiary*.

Alvearium is ſometimes alſo uſed figuratively, to denote a collection. In which ſenſe, *alvearium* amounts to much the ſame with what we otherwiſe call *theſaurus*, *cornucopia*, or the like. Vinc. Boreus has publiſhed an alvearium of law.

ALVEOLUS, in natural hiſtory, the name of the waxen cells in bee-hives. Alſo the name of a ſea-foſſil of a conic figure, compoſed of a number of cells, like bee-hives, joined into each other, with a pipe of communication.

Alveolus, in anatomy, the ſockets in the jaws wherein the teeth are fixed.—Some writers ſpeak of teeth growing without alveoli. Pliny mentions a perſon who had a tooth in his palate. Euſtachius relates, that he ſaw a man who at 60 had a tooth growing out of the middle of his fauces. Holler gives an inſtance of a perſon, whoſe teeth were of a piece with his jaws, without any inſertion into alveoli.

ALUM, in chemiſtry, a clear and tranſparent ſaline matter, uſually ſold in large maſſes, of a very auſtere and aſtringent taſte, uſeful in medicine and in various arts.

Moſt of the alum to be met with is artificially prepared by the methods related in their proper place under the article Chemistry, or by others ſimilar to them; though ſometimes a ſmall quantity is produced naturally. This native alum is mixed with heterogeneous matters, or effloreſces in various forms upon the ores during calcination. It rarely occurs in a cryſtallized ſtate, though thus it is ſaid to be met with in Egypt, Sardinia, Spain, Bohemia, and other places. It is alſo found in the waters, impregnated with fixed air, but very ſeldom in fountains or hot medicated waters.

There are ſeveral kinds of alum, to be met with; but theſe differ from one another only in being mixed with ſome ſalts which are not of the aluminous kind. That called the Roman alum has been conſidered as preferable to any other. This is uſually met with in ſmall cryſtals, and has a reddiſh colour, moſt probably owing to a ſmall quantity of calx of iron, which, however, does not in the leaſt impair its qualities. The other kinds of alum contain a portion either of vitriolated tartar or ſal ammoniac, according to the nature of the alkali uſed in its preparation. Mr Bergman informs us, that the vegetable alkali, if pure, does not hurt the alum, though it be added in the preparation; but that the volatile alkali, by adulterating it with a portion of vitriolic ſal ammoniac, renders it unfit for ſome purpoſes. The alum, made by adding a portion of clay to the liquor at the beginning of the boiling, he conſiders as equal, if not ſuperior, to Roman alum. He informs us alſo, that a kind of alum ſome time ago began to be manufactured at Brunſwick, which was equal in quality to the Roman alum. On a chemical analyſis of this alum he found it mixed with cobalt.

This ſalt is extremely uſeful in the art of dyeing; as by means of it a great number of colours are fixed and rendered permanent upon cloth, which otherwiſe would either not adhere in any degree, or only for a very ſhort time. In what manner this is accompliſhed we are very much ignorant; the conjectures and theories on this ſubject are related under the article Dyeing. It conſtitutes the baſis of crayons, which generally conſiſt of the earth of alum finely powdered and tinged for the purpoſe. In the preparation of Pruſſian blue, it prevents the baſis of martial vitriol, which is ſoluble in acids, from being precipitated by the ſuperfluous alkali employed in the preparation of that pigment; that is, the alkali which is not ſaturated by the colouring matter. As this baſis adheres more ſtrongly than the clay to the vitriolic acid, and would form a green by the mixture of its yellowneſs, the white earth of alum likewiſe, according to its quantity, dilutes the darker colours, even black itſelf, and produces an infinite number of ſhades. It is alſo of uſe in the making of candles; for being mixed with the tallow, it gives it an hardneſs and conſiſtence which it has not naturally. Wood ſufficiently ſoaked in a ſolution of alum does not eaſily take fire, and the ſame is true of paper impregnated with it; which for that reaſon is very properly employed in preſerving gun-powder, as it alſo excludes the moiſture of the air. Paper impregnated with alum is uſeful in whitening ſilver, and ſilvering braſs without heat. Alum is alſo of uſe in tanning, where it aſſiſts in reſtoring the coheſions of the ſkins almoſt entirely deſtroyed by the lime. Vintners fine down their wines, &c. with alum; fiſhers uſe it to dry codfiſh with; and bakers have mixed it with the flour to make their bread compact and white: to this laſt uſe of it great objections have been made, but unjuſtly, for it is entirely innocent, and now ſeldom uſed.

In medicine it is of conſiderable uſe as an aſtringent and tonic. It is reckoned particularly ſerviceable for reſtraining hemorrhagies, and immoderate ſecretions from the blood; but leſs proper in inteſtinal fluxes. In violent hemorrhagies, it may be given in doſes of 15 or 20 grains, and repeated every hour or half hour till the bleeding abates: in other caſes, ſmaller doſes are more adviſable; large ones being apt to nauſeate the ſtomach, and occaſion violent conſtipations of the bowels. It is uſed alſo externally, in aſtringent and repellent lotions and collyria. Burnt alum taken internally has been highly extolled in caſes of colic. In ſuch inſtances, when taken to the extent of a ſcruple for a doſe, it has been ſaid gently to move the belly, and give very great relief from the ſevere pain. Its officinal preparations are, for internal uſe, *pulvis ſtypticus*, and *aqua ſtyptica* for external applications, the *aqua aluminis*, and *coagulum aluminis* and *alumen uſtum*; which laſt is no other than the alum dried by fire, or freed from the watery moiſture, which, like other ſalts, it always retains in its cryſtalline form. By this loſs of its water it becomes ſharper, ſo as to act as a ſlight eſcharotic; and it is chiefly with this intention that it is employed in medicine, being very rarely taken internally. For theſe preparations, ſee PHARMACY.

ALUM Mines are ſaid to have been firſt found in Italy in the year 1460; and in 1506 king Henry VII. made a monopolizing grant of this commodity to Auguſtine Chigi, a merchant of Sienna. In the year 1608 the manufacture of alum was firſt invented, and ſucceſſively practiſed in England, meeting with great encouragement in Yorkſhire, where it was firſt made, from Lord Sheffield, and other gentlemen of that county. King James I. by advice of his miniſtry, aſſumed the monopoly of it to himſelf, and therefore prohibited the importation of foreign alum; and in 1625 the importation of it was further prohibited by the proclamation ot Charles I.

ALUM-works, places where alum is prepared, and manufactured in quantities for ſale. They differ from alum-mines, as in the former an artificial alum, and in the latter natural alum, is produced.

ALUNTIUM, ALONTIUM, (anc. geog.), a town in the north of Sicily, ſituated on a ſteep eminence, at the mouth of the Chydas; ſaid to be as old as the war of Troy. Now in ruins; from which aroſe the hamlet *St Filadelfo*, in the Val di Demona. The inhabitants were called *Haluntini*.

ALVUS, in anatomy, a term uſed for the belly in general, but more frequently applied to the bowels.

ALWAIDII, a ſect of Mahometans who believe all great crimes to be unpardonable.—The Alwaidii ſtand in oppoſition to the Morgii. They attribute leſs efficacy to the true belief in the ſalvation of men than the reſt of the Muſſulmans.

ALYSSUM, ALLYSON, or ALLYSOIDES, Madwort; (from *αλυσσω, to be mad;* becauſe it was believed to have the property of curing madneſs): A genus of the filiculoſa order, belonging to the tetradynamia claſs of plants: and, in the natural method, ranking under the 39th order, *Siliquoſu*. The characters are: The *calyx* is an oblong four-leav'd perianthium: The *corolla* conſiſts of four cruciform petals; with claws the length of the calyx, the petals ſhorter: The *ſtamina* conſiſt of ſix filaments, the length of the calyx, two of them rather ſhorter and denticulated; the antheræ are erect and expanding: The *piſtillum* has an ovate germen; the ſtylus is ſimple, and the length of the ſtamina; the ſtigma is obtuſe: The *pericarpium* is a ſub-globular emarginated filicle, furniſhed with a bilocular ſtylus, having an elliptic partition: The *ſeeds* are few, orbicular, and affixed to filiform receptacles.

Species. Of this genus, Linnæus enumerates 19 ſpecies; but none of them are remarkable either for beauty, or any other property, except the halimifolium, or madwort with whole ſpear-ſhaped leaves. This ſpreads itſelf upon the ground, and never riſes to any height. It produces, at the extremity of its branches, very pretty tufts of ſmall white flowers; of which it is ſeldom deſtitute for ſix or ſeven months ſucceſſively; for which reaſon it well deſerves a place in the gardens of the curious.

Culture. Though theſe plants are natives of the ſouthern parts of Europe; yet, if planted on a dry, lean, or rubbiſhy ſoil, they will endure the ſevereſt winters in the open air.—The halimifolium ſeldom continues above two or three years, and muſt therefore be often ſown to preſerve it; or, if the ſeeds are ſuffered to fall, the plants will riſe without any trouble. It may alſo be propagated by cuttings, which ought to be planted in April or May, and are very apt to take root, if kept ſhaded in the heat of the day, and gently refreſhed with water.

This plant, as already obſerved, was thought to cure ſome kinds of madneſs; but the preſent practice has entirely rejected it for this or any other purpoſe.

ALYTARCHA, a prieſt of Antioch in Syria, who, in the games inſtituted in honour of the gods, preſided over the officers who carried rods to clear away the crowd and keep order.

In the Olympic games, the alytarches had the ſame command, and obliged every perſon to preſerve order and decency.

ALZIRA, a town of Spain, in the kingdom of Valencia, ſeated on the river Xucar. E. Long. 0. 20. N. Lat. 39. 10.

AMA, in eccleſiaſtical writers, denotes a veſſel wherein wine, water, or the like, were held, for the ſervice of the euchariſt. In this ſenſe the word is alſo written amula: ſometimes alſo hama, and hamula.

AMA is ſometimes alſo uſed for a wine-meaſure, as a caſk, pipe, or the like.

AMABYR, a barbarous cuſtom which formerly prevailed in ſeveral parts of England and Wales, being a ſum of money paid to the lord when a maid was married within his lordſhip. The word is old Britiſh, and ſignifies "the price of virginity."

AMADABAT, a corruption from AHMED ABAD, or *Ahmed's city* (ſo called from a king of that name); a large and populous city of Indoſtan, and the capital of the province of Guzerat. It is ſituated in E. Long. 72. 12. N. Lat. 23. 0. Amadabat was formerly called *Guzerât*, and by Shah Jehân nicknamed *Gherd-abâd*, or "the habitation of duſt," becauſe it was much incommoded therewith. It was the ſeat of the Guzerat kings, as it is now of the Mogul governor. The city ſtands in a beautiful plain; and is watered by the little river Sabremetti, which, though not deep, in time of rains overflows the plain prodigiouſly. The walls are built with ſtone and brick, flanked at certain diſtances with great round towers and battlements. It has twelve gates; and, including the ſuburbs, is about four miles and an half long. The ſtreets are wide. The *meydân ſhâh*, or king's ſquare, is 700 paces long and 400 broad, planted round with trees. On the weſt ſide is the caſtle, well walled with free ſtone, and as ſpacious as a little city; but its inward appearance is not conformable to its external magnificence. The caravanſera is on the ſouth of the ſquare, and its chief ornament. Near the meydan alſo is the king's palace, whoſe apartments are richly ornamented: and in the midſt of the city is the Engliſh factory, where they purchaſe fine chintz, callicoes, and other Indian merchandize. The place is ſo full of gardens ſtored with fruit trees, that from an eminence it looks like a wood. The Hindoos have here an hoſpital for ſick beaſts, and another for ſick birds, which they take great care of. According to ſome late accounts, this city is little inferior to the beſt in Europe, and is thought to yield ten times as much revenue as Surat.

AMADAN, or HAMADAN, a town of Perſia between Taurus and Iſpahan, E. Long. 47. 4. N. Lat. 35. 15. It is ſeated at the foot of a mountain, where there are a great many ſprings, which water the adjacent country. The extent of the city is very large; but there are a great many waſte ſpots within it, as well as cultivated land. The houſes are built of brick hardened in the ſun, and have but a very indifferent aſpect. There is but one tolerable ſtreet; and that is where ſtuffs, garments, and the like, are expoſed to ſale: it is ſtraight, long, and wide; and the ſhops are very well furniſhed. The adjacent parts are fruitful in corn and rice, inſomuch that the neighbouring provinces are ſupplied from hence. It is ſaid to enjoy a very ſalubrious air, but the cold in winter is intenſe. The Armenians have a church in this town, but it is a very ill-contrived ſtructure. The Jews have a ſynagogue near a tomb, where they pretend Eſther and Mordecai lie interred. To this place they come in pilgrimage from ſeveral parts of the Levant. About a league from Amadan, there is a mountain called *Nalbana*, which abounds with all ſorts of curious herbs. In the ſpring, people flock to this mountain from all parts to recover their health, by ſucking in the ſalutary effluvia with their breath.

Amadan is a very ancient city. It is ſaid to have been deſtroyed by Nebuchadnezzar, and rebuilt by Darius, who brought hither all his riches. The kings of Perſia frequently retired to this place on account of its delightful ſituation; for which reaſon it obtained the name of the *Royal city*. It was conquered by the khalif Othman, and narrowly eſcaped being deſtroyed by Jenghiz Khan in 1220. It had then ſtrong walls and a good caſtle which are now in ruins. Its preſent beauty conſiſts in its gardens and ſprings.

AMADANAGER, a town in the hither peninſula of India, in the province of Decan. E. Long. 74. 15. N. Lat. 18. 10.—It was taken by the Moguls in 1598, after a ſiege or ſix months; being at that time defended by a ſtrong caſtle, ſituated on an eminence, and ſurrounded with deep ditches, into which ſeveral ſprings diſcharged their waters.

AMADIA, a trading town of Aſia, in Curdiſtan, belonging to the Turks; ſeated on a high mountain. E. Long. 43. 1. N. Lat. 36. 25.

AMADOW, a kind of black-match, tinder, or touch-wood, which comes from Germany. It is made of a ſort of large muſhrooms, or ſpungy excreſcences, which commonly grow on old trees, eſpecially oaks, aſh, and firs. This ſubſtance being boiled in common water, and afterwards dried and well beaten, is then put into a ſtrong ley prepared with ſalt-petre, after which it is again put to dry in an oven. The druggiſts ſell this match wholeſale in France, and ſeveral hawkers retail it. Some give to the amadow the name of *Pyrotechnical Spunge*, becauſe of its aptneſs to take fire.

AMADOWRY, a kind of cotton which comes from Alexandria, by the way of Marſeilles.

AMAIN, in the ſea-language, a term importing to lower ſomething at once. Thus, to *ſtrike amain*, is to lower, or to let fall, the top-ſails; to *wave amain*, is to make a ſignal, by waving a drawn ſword, or the like, as a demand that the enemy ſtrike their top-ſails.

AMAK, a ſmall iſland in the Baltic ſea, near Copenhagen, from which it is ſeparated by a canal, over which there is a draw-bridge. Amak is about four miles long and two broad; and is chiefly peopled by the deſcendants of a colony from Eaſt Frieſland, to whom the iſland was conſigned by Chriſtian II. at the requeſt of his wife Elizabeth, ſiſter of Charles V. for the purpoſe of ſupplying her with vegetables, cheeſe, and butter. From the intermarriages of theſe colonies with the Danes, the preſent inhabitants are chiefly deſcended; but as they wear their own dreſs, and enjoy peculiar privileges, they appear a diſtinct race from the natives. The iſland contains about ſix villages, and between 3000 and 4000 ſouls. It has two churches, in which the miniſters preach occaſionally in Dutch and Daniſh. The inhabitants have their own inferior tribunals; but in capital offences are amenable to the king's court of juſtice at Copenhagen. The old national habit, brought by the original colony when they firſt migrated to the iſland, is ſtill in uſe amongſt them. It reſembles the habit of the ancient Quakers, as repreſented in the pictures of the Dutch and Flemiſh painters. The men wear broad-brimmed hats, black jackets, full glazed breeches of the ſame colour, looſe at the knee, and tied round the waiſt. The women were dreſſed chiefly in black jackets and petticoats, with a piece of blue glazed cloth bound round their heads. The iſland is laid out in gardens and paſtures; and ſtill, according to the original deſign, ſupplies Copenhagen with milk, butter, and vegetables. E. Long. 12. 10. N. Lat. 55. 20.

AMAL, a town of Sweden, in the province of Daland, ſeated on the river Weſer. Is has a good harbour; and carries on a great trade, eſpecially in timber, deals, and tar. E. Long. 12. 40. N. Lat. 58. 50.

AMALEK, the ſon of Eliphaz, by Timna his concubine, and the grandſon of Eſau. Gen. xxxvi. 12. and 1. Chr. i. 36. Amalek ſucceeded Gatam in the government of Edom. He was the father of the Amalekites; a powerful people who dwelt in Arabia Petræa, between the Dead Sea and the Red Sea, or between Havila and Shur (1. Sam. xv. 7.); ſometimes in one canton, and ſometimes in another. It does not appear that they had cities: for there is no mention of any but one in the Scriptures (*id. ib.* 5.); they living generally in hamlets, caves, or tents.

The Iſraelites had ſcarce paſſed the Red Sea on their way to the wilderneſs, before the Amalekites came to attack them in the deſarts of Raphidim (Ex. xvii. 8, &c.); and put thoſe cruelly to the ſword who were obliged, either through fatigue or weakneſs, to remain behind. Moſes, by divine command, directed Joſhua to fall upon this people; to record the act of inhumanity which they had committed, in a book, in order to have it always before his eyes; and to revenge it in the moſt remarkable manner. Joſhua therefore fell upon the Amalekites, and defeated them while Moſes was upon the mountain, with Aaron and Hur in company. Moſes, during the time of the engagement, held up his hands, to which the ſucceſs of the battle was owing; for as often as he let them down, Amalek prevailed. But Moſes's hands being tired, Aaron and Hur ſupported his arms, and held them extended, while the battle laſted, which was from morning till the approach of night, when the Amalekites were cut in pieces. This happened in the year of the world 2513, before Chriſt 1491.

The ground of the enmity of the Amalekites againſt the Iſraelites is generally ſuppoſed to have been an innate hatred from the remembrance of Jacob's depriving their progenitor both of his birth-right and bleſſing. Their falling upon them, however, and that without any provocation, when they ſaw them reduced to ſo low a condition by the fatigue of their march and the exceſſive drought they laboured under, was an inhuman action, and juſtly deſerved the defeat which Joſhua gave them. Under the Judges (v. 3.) we ſee the Amalekites united with the Midianites and Moabites, in a deſign to oppreſs Iſrael; but Ehud delivered the Iſraelites from Eglon king of the Moabites (Judges iii.), and Gideon (chap. viii.) delivered them from the Midianites and Amalekites. About the year of the world 2930, Saul marched againſt the Amalekites, advanced as far as their capital, and put all the people of the country to the ſword; but ſpared the beſt of all the cattle and moveables, contrary to a divine command; which act of diſobedience was the cauſe of Saul's future misfortunes.

After this war, the Amalekites ſcarce appear any more in hiſtory. However, about the year of the world 2949, a troop of Amalekites came and pillaged Ziklag, which belonged to David (1 Sam. xxx.), where he had left his two wives Ahinoam and Abigail; but he returning from an expedition which he had made in the company of Achiſh into the valley of Jezreel, purſued them, overtook and diſperſed them, and recovered all the booty which they had carried off from Ziklag.

The Arabians maintain Amalek to have been the ſon of Ham and grandſon of Noah; that he was the father of Ad and grandfather of Schedad. Calmet thinks that this opinion is by no means to be rejected; as it is not very probable that Amalek the ſon of Eliphaz, and grandſon of Eſau, ſhould be the father of a people ſo powerful and numerous as the Amalekites were when the Iſraelites departed out of Egypt. Moſes in the book of Geneſis (xiv. 7.) relates, that in Abraham's time, long before the birth of Amalek the ſon of Eliphaz, the five confederate kings carried the war into Amalek's country, about Kadeſh; and into that of the Amorites, about Hazezontamar. The ſame Moſes (Numb. xxiv. 20.) relates, that the diviner Balaam, obſerving at a diſtance the land of Amalek, ſaid, in his prophetic ſtyle, "Amalek is the firſt, the head, the original of the nations; but his latter end ſhall be that he periſh forever." Our commentator obſerves, that this epithet of the firſt of nations cannot certainly agree with the Amalekites deſcended from the ſon of Eliphaz, becauſe the generation then living was but the third from Amalek. Beſides, Moſes never reproaches the Amalekites with attacking their brethren the Iſraelites; an aggravating circumſtance which he would not have omitted were the Amalekites deſcended from Eſau; in which caſe they had been the brethren of the Iſraelites. Laſtly, we ſee the Amalekites almoſt always joined in the Scripture with the Canaanites and Philiſtines, and never with the Edomites; and when Saul made war upon the Amalekites, and almoſt utterly deſtroyed them, we do not find that the Edomites made the leaſt motion towards their aſſiſtance, nor to revenge them afterwards. Thence it is thought probable, that the Amalekites who are ſo often mentioned in Scripture were a free people deſcended from Canaan, and devoted to the curſe as well as the other Amorites, and very different from the deſcendants of Amalek the grandſon of Eſau.

The accounts which the Arabians give us of the Amalekites deſtroyed by Saul are as follow. Amalek was the father of an ancient tribe in Arabia, exterminated in the reign of Saul. This tribe contained only the Arabians who are called *Pure;* the remains whereof were mingled with the poſterity of Joktan and Adnan and ſo became Moſarabes or Moſtaarabes; that is to ſay, Arabians blended with foreign nations. They farther believe, that Goliah, who was overcome by David, was king of the Amalekites, and that the giants who inhabited Paleſtine in Joſhua's time were of the ſame race. That at laſt part of the Amalekites retired into Africa while Joſhua was yet living, and ſettled upon the coaſts of Barbary, along the Mediterranean ſea. The ſon of Amalek was Ad, a celebrated prince among the Arabians. Some make him the ſon of Uz, and grandſon of Aram the ſon of Shem. Let this be as it will, the Mahometans ſay that Ad was the father of an Arabian tribe called *Adites;* who were exterminated, as they tell us, for not hearkening to the patriarch Eber, who preached the unity of God to them. Ad had two ſons, Schedad and Schedid.

AMALFI, an ancient city of Italy, ſituated in E. Long. 15. 20. N. Lat. 40. 35.—It is ſaid to have derived its origin from a number of Roman families, who, about the middle of the fourth century, either from private views of emolument, or in conſequence of compulſory orders from the emperor, had left Rome and embarked for Conſtantinople; but meeting with ſtorms on their paſſage, were caſt away on the ſhores of Salerno, and deprived of the means of purſuing their voyage. In this ſtate of perplexity they long remained, but at laſt came to the reſolution of ſettling on the preſent ſite of Amalfi, where they expected to enjoy ſecurity and ſufficient plenty of the neceſſaries of life. The earlieſt notice of them in this ſettlement dates no higher than the latter end of the ſixth century. Impervious mountains and inacceſſible coaſts preſerved their infant ſtate from the firſt fury of the Lombards, who ſeldom attempted the conqueſt of a maritime people.

In the year 825, when this little republic had, under the patronage of the eaſtern emperors, attained a degree of wealth and reputation ſufficient to excite the ambition of its neighbours, Sico, prince of Salerno, marched a body of troops by night; ſurpriſed Amalfi; and, carrying off the greateſt part of the inhabitants, compelled them to fix at Salerno, which had lately ſuffered a great loſs of people by an epidemical diſorder. But before the fourth year of their captivity was expired, the Amalfians took advantage of the abſence of the Salernian chiefs, who were then carrying on a war with the Beneventans; armed themſelves, and, after burning and plundering Salerno, marched in triumph back to their own country.

Here they framed a better ſyſtem of government, and reformed many abuſes in their former legiſlation; adopting various meaſures that were likely to promote internal concord and defeat the evil intentions of foreign enemies. Their firſt plan was to veſt the ſupreme authority in a temporary prefect; but the experience of a few years cauſed them to prefer lodging that power in the hands of a duke elected for the term of his natural life. Under theſe governors Amalfi attained the ſummit of her military and commercial glory. It extended its territory, which reached eaſtward from Vico Vecchio, and weſtward to the promontory of Minerva, including likewiſe the iſland of Caprea, and the two iſlands of the Galli. Towards the north it comprehended the cities of Lettere, Gragnans, Pimontio, and Capule di Franchi; towards the ſouth, thoſe of Scala, Ravelli, Minori, Majuri, Atrani, Tramonti, Agerula, Citara, Prajano, and Roſilano.

Leo IV. found the Amalfians an uſeful ally in his wars with the Infidels, and honoured the commonwealth with the title of *Defender of the Faith.* The Neapolitans, with whom, as Greek vaſſals, they were united in ſtrict bonds of friendſhip, experienced many ſignal favours at their hands; and the Muſſulmen themſelves found it expedient to court their alliance, and to enter into treaty with them. Their ſituation had from the beginning given them a turn to commerce, and their attention to naval affairs ſo much conſequence in the eyes of their protector, the emperor of Conſtantinople, that by his orders a court was eſtabliſhed at Amalfi for the deciſion of all controverſies ariſing in maritime tranſactions. Its code and reports became the general rule in thoſe caſes throughout this part of Europe; its precedents and decrees were allowed to be good authority to found judgment upon even in foreign tribunals.—To crown the mercantile and naval glory of the republic, it was reſerved to the lot of an Amalfian to make, or at leaſt to perfect, the moſt important diſcovery ever made for the improvement of navigation. Paſitano, a village which ſtands on the ſhore a few miles weſt of Amalfi, boaſts of having given birth to Flavius Gioja, the inventor of the mariner's compaſs.

The merchants of this town engroſſed the trade of the Levant, and tranſacted the commercial buſineſs of the world in a lucrative and excluſive manner. The Piſans, Venetians, and Genoeſe, roſe upon their ruin; and, after monopolizing the emoluments of trade for ſome ages, made way for the more comprehenſive and daring ſpirit of the preſent maritime powers.

At preſent Amalfi is ſubject to Naples, and is the ſee of an archbiſhop. It is but a ſhadow of what it was in its flouriſhing ſtate, when it extended over the ſtupendous rocks that hang on each ſide, ſtill crowned with battlemented walls and ruined towers. Its buildings, Mr Swinburne ſays, are not remarkable for elegance or ſize; and contain at moſt 4000 inhabitants, who ſeem to be in a poor line of life. The cathedral is an uncouth building. Under the choir is the chapel and tomb of the apoſtle St Andrew; to whoſe honour the edifice was dedicated, when Cardinal Capuano in 1208 brought his body from Conſtantinople.

AMALGAM, mercury united with ſome metal.

AMALGAMATION, the operation of making an amalgam, or mixing mercury with any metal.

For the combination of one metal with another, it is generally ſufficient that one of them be in a ſtate of fluidity. Mercury being always fluid, is therefore capable of amalgamation with other metals without heat; nevertheleſs, heat conſiderably facilitates the operation.

To amalgamate without heat requires nothing more than rubbing the two metals together in a mortar; but the metal to be united with the mercury ſhould be previouſly divided into very thin plates or grains. When heat is uſed (which is always moſt effectual, and with ſome metals indiſpenſibly neceſſary), the mercury ſhould be heated till it begins to ſmoke, and the grains of metal made red-hot before they are thrown into it. If it be gold or ſilver, it is ſufficient to ſtir the fluid with an iron rod for a little while, and then throw it into a veſſel filled with water. This amalgam is uſed for gilding or ſilvering on copper, which is afterwards expoſed to a degree of heat ſufficient to evaporate the mercury.

Amalgamation with lead or tin is effected by pouring an equal weight of mercury into either of theſe metals in a ſtate of fuſion, and ſtirring with an iron rod. Copper amalgamates with great difficulty, and iron not at all.

AMALTHÆA, the name of the Cumæan Sibyl, who offered to Tarquinius Superbus nine books, containing the Roman deſtinies, and demanded 300 pieces of gold for them. He derided her; whereupon ſhe threw three of them into the fire; and returning, aſked the ſame price for the other ſix; which being denied, ſhe burnt three more; and returned, ſtill demanding the ſame price. Upon which Tarquin conſulting the pontiffs, was adviſed to buy them. Theſe books were in ſuch eſteem, that two magiſtrates were created to conſult them upon extraordinary occaſions.

AMALTHEA, in pagan mythology, the daughter of Meliſſus, king of Crete, and the nurſe of Jupiter, whom ſhe fed with goat's milk and honey. According to others, Amalthea was a goat, which Jupiter tranſlated into the ſky, with her two kids, and gave one of her horns to the daughters of Meliſſus, as a reward for the pains they had taken in attending him. This horn had the peculiar property of furniſhing them with whatever they wiſhed for; and was thence called the *cornucopia*, or horn of plenty.

AMALTHÆUS (Jerome, John Baptiſta, and Cornielle), three celebrated Latin poets of Italy, who flouriſhed in the 16th century. Their compoſitions were printed at Amſterdam in 1685. One of the prettieſt pieces in that collection is an epigram on two children, whoſe beauty was very extraordinary, though each of them was deprived of an eye:

'Lumine Acon dextro, capta eſt Leonilla ſiniſtro;
'Et poterat forma vincere uterque deos.
'Parve puer, lumen quod habes concede ſorori;
'Sic tu cæcus Amor, ſic erit illa Venus.'

AMAMA (Sixtinus), profeſſor of the Hebrew tongue in the univerſity of Franeker, a man of great learning, was born in Frieſland, and had ſtudied under Druſius. He publiſhed a criticiſm upon the tranſlation of the Pentateuch; collated the Dutch tranſlation of the Bible with the original and the moſt accurate tranſlations; and wrote a cenſure of the Vulgate tranſlation of the hiſtorical books of the Old Teſtament, Job, the Pſalms, and Canticles. It is impoſſible to anſwer the reaſons whereby he ſhows the neceſſity of conſulting the originals,

nals. This he recommended ſo earneſtly, that ſome ſynods being influenced by his reaſons, decreed, that none ſhould be admitted into the miniſtry but ſuch as had a competent knowledge of the Hebrew and Greek text of the Scripture. He died in 1629.

AMANCE, a town in the duchy of Lorrain, upon a rivulet of the ſame name. E. Long. 6. 10. N. Lat. 48. 45.

AMAND (Mark-Anthony-Gerard, ſieur de St.), a French poet, was born at Roan in Normandy in 1594. In the epiſtle dedicatory to the third part of his works, he tells us, that his father commanded a ſquadron of ſhips in the ſervice of Elizabeth queen of England for 22 years, and that he was for three years priſoner in the Black Tower at Conſtantinople. He mentions alſo, that two brothers of his had been killed in an engagement againſt the Turks. His own life was ſpent in a continual ſucceſſion of travels, which was of no advantage to his fortune. There are miſcellaneous poems of this author, the greateſt part of which are of the comic or burleſque, and the amorous kind. Though there are many blemiſhes in his poems, yet he had the talent of reading them in ſo agreeable a manner, that every one was charmed with them. In 1650, he publiſhed "Stances ſur la groſſeſſe de la reine de Pologne et de Suede." There are ſix ſtanzas of nine verſes each. In 1653, he printed his "Moïſe ſauvé, idyle heroique." This poem had at firſt many admirers: Monſ. Chapelain called it a *ſpeaking picture;* but it has ſince fallen into contempt. Amand wrote alſo a very devout piece, intitled "Stances à M. Corneille, ſur ſon imitation de Jeſus Chriſt," which was printed at Paris in 1656. Mr Broſſettee ſays that he wrote alſo a poem upon the moon, wherein he paid a compliment to Lewis XIV. upon his ſkill in ſwimming, in which he uſed often to exerciſe himſelf when he was young, in the river Seine; but the king could not bear this poem to be read to him, which is ſaid to have affected the author to ſuch a degree, that he did not ſurvive it long. He died in 1661, being 67 years of age. He was admitted a member of the French academy, when it was firſt founded by cardinal Richlieu, in the year 1633, and Mr. Peliſſon informs us, that, in 1637, at his own deſire, he was excuſed from the obligation of making a ſpeech in his turn, on condition that he would compile the comic part of the dictionary which the academy had undertaken, and collect the burleſque terms. This was a taſk well ſuited to him; for it appears by his writings that he was extremely converſant in theſe terms, of which he ſeems to have made a complete collection from the markets and other places, where the lower people reſort.

AMAND (St.), a city of France in Bourbonois, on the confines of Berry, ſeated upon the river Cher. It was built in 1410 on the ruins of Orval. E. Long. 3. 30. N. Lat. 46. 32.

AMAND (St.), a city of the Low Countries, in the earldom of Flanders, ſeated upon the river Scarpe. It contains about 600 houſes, and 3000 or 4000 inhabitants. The abbot of the place is the temporal lord, and diſpoſes of the magiſtracy. It was given to France by the treaty of Utrecht. E. Long. 2. 35. N. Lat. 50. 27.

AMANICÆ PYLÆ, (Ptolemy); AMANIDES PYLÆ, (Strabo); AMANI PORTÆ, (Pliny): ſtraits or defiles in mount Amanus, through which Darius entered Cicilia; at a greater diſtance from the ſea than the Pylæ Ciliciæ or Syriæ, through which Alexander paſſed.

AMANTEA, a ſea-port town and biſhop's ſee of the kingdom of Naples, ſituated near the bay of Euphemia in the province of Calabria, in E. Long. 16. 20. N. Lat. 39. 15.

AMANUS, a mountain of Syria, ſeparating it from Cilicia; a branch of mount Taurus, (Cicero, Strabo, Pliny); extending chiefly eaſtward, from the ſea of Cilicia, to the Euphrates: now called *Monte Negro,* or rather *Montagna Neres,* by the inhabitants; that is, the watery mountain, as abounding in ſprings and rivulets.

AMAPALLA, a city and port-town of North America, in the province of Guatimala, ſeated on the gulph of the ſame name, in the Pacific ocean. W. Long. 63. 20. N. Lat. 12. 30.

AMARANTE, an order of knighthood, inſtituted in Sweden by queen Chriſtina, in 1653, at the cloſe of an annual feaſt, celebrated in that country, called *Wirtſchaft.* This feaſt was ſolemnized with entertainments, balls, maſquerades, and the like diverſions, and continued from evening till the next morning.—That princeſs thinking the name too vulgar, changed it into that of the *feaſt of the gods,* in regard each perſon here repreſented ſome deity as it fell to his lot. The queen aſſumed the name of *Amarante;* that is, unfading, or immortal. The young nobility, dreſſed in the habits of nymphs and ſhepherds, ſerved the gods at the table.—At the end of the feaſt, the queen threw off her habit, which was covered with diamonds, leaving it to be pulled to pieces by the maſques; and in memory of ſo gallant a feaſt, founded a military order, called in Swediſh *Ceſchilſchafft,* into which all that had been preſent at the feaſt were admitted, including 16 lords and as many ladies, beſides the queen. Their device was the cypher of *Amarante,* compoſed of two A's, the one erect, the other inverted, and interwoven together; the whole incloſed by a laurel crown, with this motto, *Dolce nella memoria.*

Bulſtrode Whitlock, the Engliſh ambaſſador from Cromwell to the court of Sweden, was made a knight of the order of *Amarante:* on which account it ſeems to be, that we ſometimes find him ſtyled *Sir Bulſtrode Whitlock.*

AMARANTHOIDES, in botany, the trivial name of a ſpecies of illecebrum. See ILLECEBRUM.

AMARANTHUS (of α privative, and μαραινω, *to wither,* becauſe the flower of this plant, when cropped does not ſoon wither), AMARANTH, or FLOWER-GENTLE: A genus of the pentandria order, belonging to the monœcia claſs of plants; and in the natural method, ranking under the 54th order, *Miſcellaneæ.* The characters are: The *male calyx* is a five or three leav'd perianthium, erect, coloured, and perſiſtent: There is no *corolla:* The *ſtamina* conſiſt of five or three erect capillary filaments, the length of the calyx; the antheræ are oblong and verſatile: The *female calyx* the ſame as the male, and no corolla: The *piſtillum* has an ovate germen; the ſtyli are three, ſhort and ſubulated; the ſtigmata ſimple and perſiſtent: The *pericarpium* is an ovate capſule, three beaked, unilocular, and cut round: The *ſeed* is one, globular, compreſſed, and large.

Species. Of this genus Linnæus enumerates 19 ſpecies; the moſt remarkable of which are the following: 1. The tricolor, or three-coloured amaranthus. This has been long cultivated in gardens on account of the beauty of its variegated leaves, which are of three colours, green, yellow, and red; and very elegantly mixed. When the plants are in full vigour, the leaves are large, and cloſely ſet from the bottom to the top of the ſtalks, and the branches form a ſort of pyramid; ſo that there is not a more beautiful plant than this when it is in full luſtre. 2. The melancholicus, bicolor, or two-coloured amaranthus. This greatly reſembles the former in its manner of growth; but the leaves have only two colours, which are an obſcure purple, and a bright crimſon. Theſe are ſo blended as to ſet off each other, and, when the plants are vigorous, make a fine appearance. 3. The caudata, with very long hanging cylindrical ſpikes. This ſpecies is a native of America. It hath an upright ſtem three feet high; the leaves and ſtalks are of a pale green colour. The ſpikes of flowers are produced from the wings of the ſtalks, and alſo at the extremities of the branches. They are of a bright purple colour, and hang downward, ſometimes to the length of two feet and an half, ſo that many of them touch the ground. 4. The maximus or tree-like amaranthus, grows with a ſtrong ſtem, to the height of ſeven or eight feet. Towards the top it ſends forth many horizontal branches, garniſhed with oblong rough green leaves. At the extremity of every ſhoot, the cylindrical ſpikes of flowers are produced. They are of a purple colour, and hang downward like the laſt; but are ſeldom half the length, tho' much thicker than the former. 5. The ſanguineus, with compound ſpikes, and oblong oval leaves. This is a native of the Bahama iſlands. It is an eſculent plant, and bears fine flowers. It grows to the height of three feet, with purple ſtalks and leaves. The ſpikes are ſhort and cylindrical, of a bright purple at firſt, but afterwards fade to a darker colour. They are frequently produced from the wings of the ſtalks; but at the extremity of the ſtalk ariſes a large cluſter of ſpikes, which are placed croſs-wiſe, with one upright ſtalk in the middle. 6. The oleraceus, with obtuſe indented leaves. This has no beauty; but it is uſed by the Indians as a ſubſtitute to cabbage.

Culture. The two firſt of theſe ſpecies being tender, require ſome art and care to bring them to perfection in Britain, by a ſucceſſion of hot-bed, with proper waterings, airings, and ſhadings.

Where people are curious in having theſe annual plants in great perfection, there ſhould be a glaſs-caſe erected, with upright and ſloping glaſſes on every ſide, with a pit in the bottom for tan, in which the pots ſhould be plunged. If this is raiſed eight or nine feet to the ridge, and the upright glaſſes are five feet, there will be room enough to raiſe theſe and other annual plants to great perfection; and in ſuch a building, many tender vegetables, which rarely perfect their ſeeds in a cold climate, may be every year brought forward ſo as to ripen their ſeeds.

AMARYLLIS, LILY-ASPHODEL: A genus of the monogynia order, belonging to the hexandria claſs of plants; and in the natural method, ranking under the 9th order, *Spathaceæ*. The characters are: The *calyx* is an oblong obtuſe ſpatha, emarginated, and withering: The *corolla* conſiſts of ſix petals, lanced: The *ſtamina* conſiſt of ſix ſubulated filaments; the antheræ oblong, incumbent, and aſcending: The *piſtillum* has a roundiſh ſulcated germen beneath; a filiform ſtylus, nearly the length of the ſtamina; the ſtigma trifid and ſlender: The *pericarpium* is an ovate trilocular capſule, with three valves: The *ſeeds* are many.

Principal Species. 1. The lutea, or autumnal narciſſus. This is uſually ſold by gardeners, along with colchicums, for autumnal ornaments to gardens. For this purpoſe it is very proper, as it will keep flowering from the beginning of September to the middle of November, provided the froſt is not ſo ſevere as to deſtroy the flowers. Although there is but one flower in each cover, yet there is a ſucceſſion of flowers from the ſame root, eſpecially when they are ſuffered to remain three or four years unremoved. The flowers ſeldom riſe above three or four inches high. They are ſhaped ſomewhat like the flowers of the yellow crocus; the green leaves come up at the ſame time like the ſaffron; and, after the flowers are paſt, the leaves increaſe all the winter. The roots are bulbous, and ſhaped like thoſe of the narciſſus; ſo are proper ornaments for ſuch borders as are planted with cyclamens, ſaffron, autumnal crocus, colchicums, and ſuch low autumnal flowers. 2. The formoſiſſima, or jacobæa lily, produces its flowers two or three times in a year, without being regular to any ſeaſon. The flowers are of a deep red, the under petals very large, and the whole flower ſtands nodding on one ſide of the ſtalk, making a beautiful appearance. The ſtems of theſe flowers are produced from the ſides of the bulbs; ſo that when the flowers produced on one ſide are decayed, another ſtalk ariſes from the other ſide of the bulb; but there is no more than one flower produced on the ſame ſtalk. When the roots are in vigour, flowers will be produced from March to the beginning of September. The farnienſis, or Guernſey lily, is ſuppoſed to have come originally from Japan, but has been many years cultivated in the gardens of Guernſey and Jerſey; in both which places they ſeem to thrive as well as if it was their native country, and from theſe iſlands their roots are ſent annually to the curious in moſt parts of Europe. The flowers of this ſpecies are admired for the richneſs of their colour, which is commonly red, though they have no ſcent. They appear towards the end of September; and, if properly managed, will continue a month in beauty. The roots of theſe plants do not flower again the ſucceeding year, as is the caſe with many other bulbs: but if their bulbs contain two buds in their centre, which is often the caſe, they frequently flower twice in three years; after which the ſame individual root does not flower again in ſeveral years, but only the offſets from it. 4. The regina, or belladona lily, is a native of Portugal, where it was formerly cultivated in great plenty; but of late it has been ſupplanted by the jacobæa lily, ſo that the roots which have been brought from that country for ſome time paſt for the belladona, have generally proved the jacobæa lily. This kind, if properly managed, will ſometimes put out two or three ſtems, growing near three feet high, and produce many flowers in each umbel, which make a fine appearance during the month of October. 5. The zeylanica, or Ceylon lily, is a native of the Weſt Indies, and uſually flowers in June. Sometimes the ſame root will flower again in autumn, but the flowers are of no long duration. 6. The orientalis, or lily daffodil, with leaves ſhaped like a tongue. This is a native of the Cape of Good Hope. The bulbs of the root are large and almoſt round; the leaves long, broad, and rounded at their extremities; theſe ſpread two ways on the ſurface of the ground, and do not come up till after the flower-ſtem appears, which is generally in November. After the flowers are paſt, the leaves increaſe till ſpring, and in May they begin to decay; ſo that from the middle of June to October the roots are entirely deſtitute of leaves.

Culture. The firſt ſort is very hardy, and will thrive in almoſt any ſoil or ſituation; but will ſucceed beſt in a freſh light dry ſoil, and not too near the dripping of trees, or too near walls. It increaſes very faſt by offſets, by which all the other ſpecies are alſo to be propagated. Theſe roots may be tranſplanted any time from May to the end of July; after which it will be too late to remove them.—The jacobæa ought to be kept in a moderate ſtove all winter; in which caſe it will ſend forth plenty of offsets, that will produce vigorous plants.—The roots of the Guernſey lily are generally brought over in June and July; but the ſooner they are taken out of the ground after the leaves decay, the better: for altho' the roots which are taken up when their flower-ſtems begin to appear, will flower; yet their flowers will not be ſo large, nor will their roots be near ſo good after, as thoſe which were removed before they ſent forth freſh fibres. When theſe roots come over, they ſhould be planted in pots filled with freſh, light, ſandy earth, mixed with a little very rotten dung, and placed in a warm ſituation, obſerving now and then to refreſh the earth with water: but by no means let them have too much wet, which would rot their roots, eſpecially before they come up. About the middle of September, ſuch of the roots as are ſtrong enough to flower will begin to ſhow the bud of their flower-ſtem: therefore theſe pots ought to be removed into a ſituation where they may have the benefit of the ſun, and be ſheltered from ſtrong winds. When the flowers begin to open, the pots ſhould be removed under ſhelter, to prevent injury from too much wet.—After the flowers are decayed, the green leaves will begin to ſhoot forth in length; and, if ſheltered from ſevere cold, will continue growing all winter; but they muſt have as much free air as poſſible in mild weather, and are to be covered only in great rains or froſts. For this purpoſe, a common hot-bed frame is the moſt proper ſhelter for them; the glaſſes of which may be taken off every day in dry open weather, which will encourage the leaves to grow ſtrong and broad. The roots ſhould be tranſplanted every fourth or fifth year, toward the end of June or beginning of July; the offsets alſo ſhould be taken off and planted in pots, where in three years time they will produce flowers. The other ſpecieſes of the amaryllis may eaſily be raiſed by taking care to ſhelter them in a ſtove from the winter's cold.

AMARYNTHUS (anc. geog.), a hamlet of Eretrias, in the iſland of Euboea, about ſeven ſtadia diſtant from its walls. Here Diana was worſhipped by an annual ſolemnity, at which thoſe of Caryſtus aſſiſted; hence the title of the goddeſs was *Amarynthis*, and *Amaryſia*.

AMASIA (anc. geog.), now *Marpurg*, a city in the landgraviate of Heſſe, on the Lahn. According to others, it is Embden in Weſtphalia.

Amasia, an ancient town of Turkey, in Natolia, remarkable for the birth of Strabo the geographer. It is the reſidence of a baſhaw, and gives its name to the province it ſtands in, where there are the beſt wines and the beſt fruits in Natolia. It is ſeated near the river Iris or Caſalmack; and was anciently the reſidence of the kings of Cappadocia. E. Long. 36. 10. N. Lat. 39. 33.

Amasia, the name of the northern diviſion of Leſſer Aſia, lying on the ſouth ſhore of the Euxine ſea in Natolia. It takes its name from Amaſia the capital, mentioned in the preceding article.

AMASONIA, in botany: A genus of the angioſpermia order, belonging to the didynamia claſs of plants; the characters of which are: The *calyx* is a tripartite monophyllous perianthium, bell-ſhaped and perſiſtent: The *corolla* is monopetalous and tubular; the border quinquefid, expanding, and ſmall: The *ſtamina* conſiſt of four filaments longer than the corolla; the antheræ oval and incumbent: The *piſtillum* has an ovate germen; the ſtylus the length of the ſtamina; the ſtigmata two, acute: There is no *pericarpium*: The *ſeed* is an ovate unilocular nut, the length of the calyx.

AMATHUS, a very ancient town in the ſouth of Cyprus (Strabo, Ptolemy): ſo called from Amathus the founder; or, according to others, from Amath, a Phœnician town ſacred to Venus, with a very ancient temple of Adonis and Venus: and hence Venus is denominated *Amathuſia* (Tacitus). According to Ovid, it was a place rich in copper-ore, and where the inhabitants became *Ceraſtæ*, or horned. Now called *Limiſſo*.

Amathus (anc. geog.), a town of the tribe of Gad, beyond Jordan; but whether at a greater or leſs diſtance from it, is not ſo eaſy to determine. Euſebius places it in the Lower Peræa; Reland, in Ramoth-Gilead. Gabinius, proconſul of Syria, eſtabliſhed five juridical conventions in Judea; two of which were on the other ſide Jordan; one at Gadara, the other at Amathus (Joſephus).

AMATORII musculi, in anatomy, a term ſometimes uſed for the obliquus ſuperior and obliquus inferior muſcles of the eye, as theſe muſcles aſſiſt in ogling or drawing the eye ſideways.

AMATRICE, a city of the kingdom of Naples, in the farther Abruzzo, upon the confines of the pope's territories, and the marquiſate of Ancona.

AMAUROSIS, in medicine, a deprivation of ſight, the eye remaining fair and ſeemingly unaffected. A perfect amauroſis is when the blindneſs is total; when there is ſtill a power of diſtinguiſhing light from darkneſs, the diſeaſe is called by M. de St Ives an *imperfect amauroſis*. There is a periodical ſort which comes on inſtantaneouſly, continues for hours, or days, and then diſappears. Mr Hey, ſurgeon at Leeds, mentions ſeveral caſes of patients afflicted with the amauroſis who were relieved by being electrified.

AMAZONIA, or the country of the American

AMAZONS, is ſituate between 50 and 70 degrees of weſt longitude; and between the equator and 15 degrees of ſouth latitude; being bounded on the ſouth by La Plata, on the weſt by Peru, on the north by the province of Terra Firma, and on the eaſt by Brazil.

With reſpect to the Amazons ſaid to have given name to this territory, they have been repreſented as governed and led to war only by their queen. No men were ſuffered to live among them; though thoſe of ſome neighbouring nations were ſuffered to viſit them, at a certain ſeaſon, for the ſake of procreation. The females iſſuing from this commerce were bred up with care, and inſtructed in what relates to war and government; as to the males, they were ſent away into the country of their fathers. But no ſuch nation is at preſent to be found, any more than the giants and canibals mentioned by the firſt adventurers thither.

Amazonia is generally a flat region, abounding in woods, lakes, rivers, bogs, and moraſſes. The chief river, and one of the largeſt in the world, is that called the river of Amazons, or the Orellana, which is formed by two large rivers, the one riſing in the province of Quito, a little ſouth of the equator, in 73 degrees of weſt longitude, and the other, named Xauxa, riſing in the lake of Bourbon, near the Andes, in ten degrees of ſouth latitude. Thoſe two rivers uniting on the confines of Peru and Amazonia, in three degrees odd minutes of ſouth latitude, aſſume the name of Amazon; whence running eaſtward upwards of 200 miles, and afterwards inclining to the north they fall into the Atlantic ocean by 84 channels, which in the rainy ſeaſon overflow the adjacent country. Beſides the two ſtreams mentioned, a multitude of others, both on the north and ſouth ſide, contribute to the formation of this extraordinary river. As it runs almoſt acroſs the broadeſt part of South America, it is computed to be between four and five thouſand miles in length, including all its windings. Its channel from Junta de los Reyos, about 60 degrees from its head, to the river Maranhon, is from one to two leagues broad; it then widens from three to four, and becomes gradually broader as it approaches the ocean. Between the places laſt mentioned, its depth is from five to ten fathom; but from Maranhon to Rio Negro it increaſes to 20 fathom; after which it is ſometimes 30, and ſometimes 50 fathoms, or more, till it comes near the end of its courſe. It has no ſand-banks, nor does the ſhore ſhelve ſo as to render it dangerous for veſſels. The manetu and tortoiſe abound both upon the banks of this and the other rivers; and the fiſhermen muſt be upon their guard againſt the crocodile, aligators, and water-ſerpents, which alſo ſwarm here.

The air, as in the countries under the ſame parallel, is obſerved to be nearly as cool under the equator as about the tropics, on account of the rains continuing longer, and the ſky in that ſeaſon being clouded. Beſides, an eaſterly wind ſets from the Atlantic up the river ſo ſtrong, that veſſels are carried by it againſt the ſtream.

The produce of the country is Indian corn and the caſſavi root, of which they make flour and bread; tobacco, cotton, ſugar, ſarſaparilla, yams, potatoes, and other roots. They have alſo plenty of veniſon, fiſh, and fowl. Among the latter are vaſt flocks of parrots of all colours, the fleſh of which ſerves for food and the feathers for ornament. All the trees here are evergreens; and fruits, flowers, and herbage, are in perfection all the year round. The principal fruits are cocoa-nuts, ananas or pine-apples, guavas, bananas, and ſuch others as are uſually found between the tropics. The foreſt and timber trees are cedar, Brazil wood, oak, ebony, logwood, iron-wood, ſo called from its weight and hardneſs, and ſeveral ſorts of dyeing wood.

The natives are of the common ſtature, with good features, a copper complexion, black eyes and hair. It is computed that there are of them about 150 different tribes or nations, and the villages are ſo numerous as to be within call of one another. Among thoſe the Homagues, a people near the head of the river, are famous for their cotton manufactures; the Jurines, who live between five and ten degrees of latitude, for their joiners work; and the Wroſiſſars for their earthen ware. The Topinambes, who inhabit a large iſland in the river, are remarkable for their ſtrength. Some of thoſe nations frequently make war upon each other. Their armour conſiſts of darts, javelins, bows and arrows, and they wear targets of cane, or fiſh-ſkin. They make ſlaves of their priſoners, whom they otherwiſe uſe very well. Every tribe is governed by its reſpective chief or king, the marks of whoſe dignity are a crown of parrot's feathers, a chain of lion's teeth or claws hung round his neck, or girt about his waiſt, and a wooden ſword, which he carries in his hand.

Moſt of thoſe nations, except the Homagues, go naked. The men thruſt pieces of cane through their ears and under-lips, as well as through the ſkin of the pudenda. At the griſtle of their noſes they alſo hang glaſs beads, which wag to and fro when they ſpeak. They are ſuch ſkilful markſmen, that they will ſhoot fiſh as they ſwim; and what they catch they eat without either bread or ſalt. They worſhip images, which they always carry with them on their expeditions; but they neither have temples nor any order of prieſts; and permit both polygamy and concubinage.

The country affords neither gold nor ſilver mines; only a ſmall quantity of the former is found in the rivulets which fall into the Amazon near its ſources in Peru. While the Spaniards imagined that it contained thoſe metals, they made great efforts from Peru to reduce this territory to ſubjection; till being at length undeceived, they abandoned the deſign.

AMAZONS, in antiquity, a nation of female warriors, who founded an empire in Aſia Minor, upon the river Thermodoon, along the coaſts of the Black Sea. They are ſaid to have formed a ſtate out of which men were excluded. What commerce they had with that ſex, was only with ſtrangers; they killed all their male children; and they cut off the right breaſts of their females, to make them more fit for the combat. From which laſt circumſtance it is, that they are ſuppoſed to take their name, viz. from the privative *α*, and *μαζος mamma*, "breaſt." But Dr Bryant, in his Analyſis of Ancient Mythology, explodes this account as fabulous; and obſerves, that they were in general Cuthite colonies from Egypt and Syria, who formed ſettlements in different countries, and that they derived their name from *zon*, the "ſun," which was the national object of worſhip. Vol. iii. p. 463.—It has indeed

deed been controverted even among ancient writers, whether ever there really were ſuch a nation as that of the Amazons. Strabo, Palæphatus, and others, deny it. On the contrary, Herodotus, Pauſanius, Diodorus Siculus, Trogus Pompeius, Juſtin, Pliny, Mela, Plutarch, &c. expreſsly aſſert it.

M. Petit, a French phyſician, publiſhed a Latin diſſertation in 1685, to prove that there was really a nation of Amazons; it contains abundance of curious inquiries, relating to their habit, their arms, the cities built by them, &c. Others of the moderns alſo maintain, that their exiſtence is ſufficiently proved by the teſtimony of ſuch of the hiſtorians of antiquity as are moſt worthy of credit; by the monuments which many of them have mentioned; and by medals, ſome of which are ſtill remaining; and that there is not the leaſt room to believe that what is ſaid of them is fabulous.

The Amazons are mentioned by the moſt ancient of the Greek writers. In the third book of the Iliad, Homer repreſents Priam ſpeaking of himſelf as having been preſent, in the earlier part of his life, in a battle with the Amazons: and ſome of them afterwards came to the aſſiſtance of that prince during the ſiege of Troy.

The Amazons are particularly mentioned by Herodotus. That hiſtorian informs us, that the Grecians fought a battle with the Amazons on the river Thermodoon, and defeated them. After their victory, they carried off all the Amazons they could take alive, in three ſhips. But whilſt they were out at ſea, theſe Amazons conſpired againſt the men, and killed them all. Having, however, no knowledge of navigation, nor any ſkill in the uſe of the rudder, ſails, or oars, they were driven by wind and tide till they arrived at the precipices of the lake Mæotis, in the territories of the Scythians. Here the Amazons went aſhore, and marching into the country, ſeized and mounted the firſt horſes they met with, and began to plunder the inhabitants. The Scythians at firſt conceived them to be men; but after they had had ſkirmiſhes with them, and taken ſome priſoners, they diſcovered them to be women. They were then unwilling to carry on hoſtilities againſt them; and by degrees a number of the young Scythians formed connections with them, and were deſirous that theſe gentle dames ſhould live with them as wives, and be incorporated with the reſt of the Scythians. The Amazons agreed to continue their connection with their Scythian huſbands, but refuſed to aſſociate with the reſt of the inhabitants of the country, and eſpecially with the women of it. They afterwards prevailed upon their huſbands to retire to Sarmatia, where they ſettled. "Hence," ſays Herodotus, "the wives of the Sarmatians ſtill continue their ancient way of living. They hunt on horſeback in the company of their huſbands, and ſometimes alone. They march with their armies, and wear the ſame dreſs with the men. The Sarmatians uſe the Scythian language, but corrupted from the beginning, becauſe the Amazons never learned to ſpeak correctly. Their marriages are attended with this circumſtance: no virgin is permitted to marry till ſhe has killed an enemy in the field; ſo that ſome always grow old before they can qualify themſelves as the law requires."

Diodorus Siculus ſays, "There was formerly a nation, who dwelt near the river Thermodoon, which was ſubjected to the government of women, and in which the women, like men, managed all the military affairs. Among theſe female warriors, it is ſaid, was one who excelled the reſt in ſtrength and valour. She aſſembled together an army of women, whom ſhe trained up in military diſcipline, and ſubdued ſome of the neighbouring nations. Afterwards, having by her valour increaſed their fame, ſhe led her army againſt the reſt; and being ſucceſsful, ſhe was ſo puffed up, that ſhe ſtyled herſelf the daughter of Mars, and ordered the men to ſpin wool, and to do the work of the women within doors. She alſo made laws, by which the women were enjoined to go to the wars, and the men to be kept at home in a ſervile ſtate, and employed in the meaneſt offices. They alſo debilitated the arms and thighs of thoſe male children who were born to them, that they might be thereby rendered unfit for war. They ſeared the right breaſts of their girls, that they might be no hindrance to them in fighting: from whence they derived the name of Amazons. Their queen, having become extremely eminent for ſkill and knowledge in military affairs, at length built a large city at the mouth of the river Thermodoon, and adorned it with a magnificent palace. In her enterprizes ſhe exactly adhered to military diſcipline and good order; and ſhe added to her empire all the adjoining nations, even to the river Tanais. Having performed theſe exploits, ſhe at laſt ended her days like a hero, falling in a battle, in which ſhe had fought courageouſly. She was ſucceeded in the kingdom by her daughter, who imitated the valour of her mother, and in ſome exploits excelled her. She cauſed the girls from their very infancy to be exerciſed in hunting, and to be daily trained up in military exerciſes. She inſtituted ſolemn feſtivals and ſacrifices to Mars and Diana, which were named Tauropoli. She afterwards carried her arms beyond the river Tanais, and ſubdued all the people of thoſe regions, even unto Thrace. Returning thence with a great quantity of ſpoils into her own kingdom, ſhe cauſed magnificent temples to be erected to the deities before mentioned; and ſhe gained the love of her ſubjects by her mild and gentle government. She afterwards undertook an expedition againſt thoſe who were on the other ſide of the river, and ſubjected to her dominion a great part of Aſia, extending her arms as far as Syria."

Diodorus alſo mentions another race of Amazons who dwelt in Africa; and whom he ſpeaks of as being of greater antiquity than thoſe who lived near the river Thermodoon. "In the weſtern parts of Lybia," ſays he, "upon the borders of thoſe tracts that are habitable, there was anciently a nation under the government of women, and whoſe manners and mode of living were altogether different from ours. It was the cuſtom for theſe women to manage all military affairs; and for a certain time, during which they preſerved their virginity, they went out as ſoldiers into the field. After ſome years employed in this manner, when the time appointed for this purpoſe was expired, they aſſociated themſelves with men, in order to obtain children. But the magiſtracy, and all public offices, they kept entirely in their own hands. The men, as the women are with us, were employed in houſehold affairs, ſubmitting themſelves wholly to the authority of their wives. They were not permitted to take any part in military affairs, or to have any command, or any public authority, which might have any tendency to encourage them to caſt off the yoke of their wives. As ſoon as any child was born, it was delivered to the father, to be fed with milk or ſuch other food as was ſuitable to its age. If females were born, they ſeared their breaſts, that they might not be burdenſome to them when they grew up; for they conſidered them as great hindrances in fighting."

Juſtinian repreſents the Amazonian republic to have taken its riſe in Scythia. The Scythians had a great part of Aſia under their dominion upwards of 400 years, till they were conquered by Ninus, the founder of the Aſſyrian empire. After his death, which happened about 1150 years before the Chriſtian æra, and that of Semiramis and their ſon Ninias, Illinus and Scolopites, princes of the royal blood of Scythia, were driven from their country by other princes, who like them aſpired to the crown. They departed with their wives, children, and friends; and being followed by a great number of young people of both ſexes, they paſſed into Aſiatic Sarmatia, beyond mount Camaſſus, where they formed an eſtabliſhment, ſupplying themſelves with the riches they wanted, by making excurſions into the countries bordering on the Euxine Sea. The people of thoſe countries, exaſperated by the incurſions of their new neighbours, united, ſurpriſed, and maſſacred the men.

The women then reſolving to revenge their death, and at the ſame time to provide for their own ſecurity, reſolved to form a new kind of government, to chooſe a queen, enact laws, and maintain themſelves, without men, even againſt the men themſelves. This deſign was not ſo very ſurpriſing as at firſt ſight appears: for the greateſt number of the girls among the Scythians had been inured to the ſame exerciſes as the boys; to draw the bow, to throw the javelin, to manage other arms; to riding, hunting, and even the painful labours that ſeem reſerved for men; and many of them, as among the Sarmatians, accompanied the men in war. Hence they had no ſooner formed their reſolution, than they prepared to execute it, and exerciſed themſelves in all military operations. They ſoon ſecured the peaceable poſſeſſion of the country; and not content with ſhowing their neighbours that all their efforts to drive them thence or ſubdue them were ineffectual, they made war upon them, and extended their own frontiers. They had hitherto made uſe of the inſtructions and aſſiſtance of a few men that remained in the country; but finding at length that they could ſtand their ground, and aggrandize themſelves, without them, they killed all thoſe whom flight or chance had ſaved from the fury of the Sarmatians, and for ever renounced marriage, which they now conſidered as an inſupportable ſlavery. But as they could only ſecure the duration of their new kingdom by propagation, they made a law to go every year to the frontiers, to invite the men to come to them; to deliver themſelves up to their embraces, without choice on their part, or the leaſt attachment; and to leave them as ſoon as they were pregnant. All thoſe whom age rendered fit for propagation, and were willing to ſerve the ſtate by breeding girls, did not go at the ſame time in ſearch of men: for in order to obtain a right to promote the multiplication of the ſpecies, they muſt firſt have contributed to its deſtruction: nor was any thought worthy of giving birth to children till ſhe had killed three men.

If from this commerce they brought forth girls, they educated them; but with reſpect to the boys, if we may believe Juſtin, they ſtrangled them at the moment of their birth: according to Diodorus Siculus, they twiſted their legs and arms, ſo as to render them unfit for military exerciſes; but Quintus Curtius, Philoſtratus, and Jordarus, ſay, that the leſs ſavage ſent them to their fathers. It is probable, that at firſt, when their fury againſt the men was carried to the greateſt height, they killed the boys: that when this fury abated, and moſt of the mothers were filled with horror at depriving the little creatures of the lives they had juſt received from them, they fulfilled the firſt duties of a mother; but, to prevent their cauſing a revolution in the ſtate, maimed them in ſuch a manner as to render them incapable of war, and employed them in the mean offices which theſe warlike women thought beneath them: in ſhort, that, when their conqueſts had confirmed their power, their ferocity ſubſiding, they entered into political engagements with their neighbours; and the number of the males they had preſerved becoming burthenſome, they, at the deſire of thoſe who rendered them pregnant, ſent them the boys, and continued ſtill to keep the girls.

As ſoon as the age of the girls permitted, they took away the right breaſt, that they might draw the bow with the greater force. The common opinion is, that they burnt that breaſt, by applying to it, at eight years of age, a hot brazen inſtrument, which inſenſibly dried up the fibres and glands: ſome think that they did not make uſe of ſo much ceremony, but that when the part was formed they got rid of it by amputation: ſome, again, with much greater probability, aſſert, that they employed no violent meaſures; but, by a continual compreſſion of that part from infancy, prevented its growth, at leaſt ſo far as to hinder its ever being incommodious in war.

Plutarch, treating of the Amazons in his life of Theſeus, conſiders the accounts which had been preſerved concerning them as partly fabulous and partly true. He gives ſome account of a battle which had been fought between the Athenians and the Amazons at Athens; and he relates ſome particulars of this battle which had been recorded by an ancient writer named Clidemus. He ſays, "That the left wing of the Amazons moved towards the place which is yet called Amazonium, and the right to a place called Pryx, near Chryſa; upon which the Athenians, iſſuing from behind the temple of the muſes, fell upon them; and that this is true, the graves of thoſe that were ſlain, to be ſeen in the ſtreets that lead to the gate Piraica, by the temple of the hero Chalcodue, are a ſufficient proof. And here it was that the Athenians were routed, and ſhamefully turned their backs to women, as far as to the temple of the Furies. But freſh ſupplies coming in from Palladium, Ardettus, and Lyceum, charged their right wing, and beat them back into their very tents; in which action a great number of the Amazons were ſlain." In another place he ſays, "It appears that the paſſage of the Amazons through Theſſaly was not without oppoſition; for there are yet to be ſeen many of their ſepulchres near Scotuſæa and Cynocephalæ." And in his life of Pompey, ſpeaking of the Amazons, Plutarch ſays, "They inhabit thoſe parts of mount Caucaſus that look towards the Hyrcanian ſea (not bordering upon the Albanians, for the territories of the Getæ and the Leges lie betwixt): and with theſe people do they yearly, for two months only, accompany and cohabit, bed and board, near the river Thermodoon. After that they retire to their own habitations, and live alone all the reſt of the year."

Quintus Curtius ſays, "The nation of the Amazons is ſituated upon the borders of Hyrcania, inhabiting the plains of Thermiſcyra, near the river Thermodoon. Their queen was named Thaleſtris, and ſhe had under her ſubjection all the country that lies between mount Caucaſus and the river Phaſis. This queen came out of her dominions, in conſequence of an ardent deſire ſhe had conceived to ſee Alexander; and being advanced near the place where he was, ſhe previouſly ſent meſſengers to acquaint him, that the queen was come to have the ſatisfaction of ſeeing and converſing with him. Having obtained permiſſion to viſit him, ſhe advanced with 300 of her Amazons, leaving the reſt of her troops behind. As ſoon as ſhe came within ſight of the king, ſhe leaped from her horſe, holding two javelins in her right hand. The apparel of the Amazons does not cover all the body; for their left ſide is naked down to the ſtomach, nor does the ſkirts of their garments, which they tie up in a knot, reach below their knees. They preſerve their left breaſt entire, that they may be able to ſuckle their female offspring; and they cut off and ſear their right, that they may draw their bows, and caſt their darts, with the greater eaſe. Thaleſtris looked at the king with an undaunted countenance, and narrowly examined his perſon; which did not, according to her ideas, come up to the fame of his great exploits: For the barbarians have a great veneration for a majeſtic perſon, eſteeming thoſe only to be capable of performing great actions, on whom nature has conferred a dignified appearance. The king having aſked her whether ſhe had any thing to deſire of him, ſhe replied, without ſcruple or heſitation, that ſhe was come with a view to have children by him, ſhe being worthy to bring him heirs to his dominions. Their offspring, if of the female ſex, ſhe would retain herſelf; and if of the male ſex, it ſhould be delivered to Alexander. He then aſked her whether ſhe would accompany him in his wars? But this ſhe declined, alleging, That ſhe had left nobody to take care of her kingdom. She continued to ſolicit Alexander, that he would not ſend her back without conforming to her wiſhes; but it was not till after a delay of 13 days that he complied. She then returned to her own kingdom."

Juſtin alſo repeatedly mentions this viſit of Thaleſtris to Alexander; and in one place he ſays, that ſhe made a march of 25 days, in order to obtain this meeting with him. The interview between Alexander and Thaleſtris is likewiſe mentioned by Diodorus Siculus. The learned Goropius, as he is quoted by Dr Petit, laments, in very pathetic terms, the hard fate of Thaleſtris, who was obliged to travel ſo many miles, and to encounter many hardſhips, in order to procure this interview with the Macedonian prince; and, from the circumſtances, is led to conſider the whole account as incredible. But Dr Petit, with equal erudition, with equal eloquence, and with ſuperior force of reaſoning, at length determines, that her journey was not founded upon irrational principles, and that full credit is due to thoſe grave and venerable hiſtorians by whom this tranſaction has been recorded.

The Amazons are repreſented as being armed with bows and arrows, with javelins, and alſo with an axe of a particular conſtruction, which was denominated the axe of the Amazons. According to the elder Pliny, this axe was invented by Penthiſilea, one of their queens. On many ancient medals are repreſentations of the Amazons, armed with theſe axes. They are alſo ſaid to have had bucklers in the ſhape of a half-moon.

The Amazons are mentioned by many other ancient authors beſide thoſe which have been enumerated; and if any credit be due to the accounts concerning them, they ſubſiſted through ſeveral ages. They are repreſented as having rendered themſelves extremely formidable; as having founded cities, enlarged the boundaries of their dominions, and conquered ſeveral other nations.

That at any period there ſhould have been women, who, without the aſſiſtance of men, built cities and governed them, raiſed armies and commanded them, adminiſtered public affairs, and extended their dominion by arms, is undoubtedly ſo contrary to all that we have ſeen and known of human affairs, as to appear in a very great degree incredible; but that women may have exiſted ſufficiently robuſt and ſufficiently courageous to have engaged in warlike enterpriſes, and even to have been ſucceſsful in them, is certainly not impoſſible, however contrary to the uſual courſe of things. In ſupport of this ſide of the queſtion, it may be urged, that women who have been early trained to warlike exerciſes, to hunting, and to an hard and laborious mode of living, may be rendered more ſtrong, and capable of more vigorous exertions, than men who have led indolent, delicate, and luxurious lives, and who have ſeldom been expoſed even to the inclemencies of the weather. The limbs of women, as well as of men, are ſtrengthened and rendered more robuſt by frequent and laborious exerciſe. A nation of women, therefore, brought up and diſciplined as the ancient Amazons are repreſented to have been, would be ſuperior to an equal number of effeminate men; though they might be much inferior to an equal number of hardy men trained up and diſciplined in the ſame manner.

That much of what is ſaid of the Amazons is fabulous, there can be no reaſonable doubt; but it does not therefore follow, that the whole is without foundation. The ancient medals and monuments on which they are repreſented are very numerous, as are alſo the teſtimonies of ancient writers. It ſeems not rational to ſuppoſe that all this originated in fiction, though it may be much blended with it. The Abbé Guyon ſpeaks of the hiſtory of the Amazons as having been regarded by many perſons as fabulous, "rather from prejudice than from any real and ſolid examination;" and it muſt be acknowledged, that the arguments in favour of their exiſtence, from ancient hiſtory, and from ancient monuments, are extremely powerful. The fact ſeems to be, that truth and fiction have been blended in the narrations concerning theſe ancient heroines.

Inſtances of heroiſm in women have occaſionally occurred in modern times, ſomewhat reſembling that of the ancient Amazons. The times and the manners of chivalry in particular, by bringing great enterpriſes, bold adventures, and extravagant heroiſm, into faſhion, inſpired the women with the ſame taſte. The women, in conſequence of the prevailing paſſion, were now ſeen in the middle of camps and of armies. They quitted the ſoft and tender inclinations, and the delicate offices of their own ſex, for the toils and the toilſome occupation of ours. During the cruſades, animated by the double enthuſiaſm of religion and of valour, they often performed the moſt romantic exploits; obtained indulgencies on the field of battle, and died with arms in their hands, by the ſide of their lovers or of their huſbands.

In Europe, the women attacked and defended fortifications; princeſſes commanded their armies, and obtained victories. Such was the celebrated Joan de Montfort, diſputing for her duchy of Bretagne, and fighting in perſon. Such was that ſtill more celebrated Margaret of Anjou, active and intrepid general and ſoldier, whoſe genius ſupported a long time a feeble huſband; which taught him to conquer; which replaced him upon the throne; which twice relieved him from priſon; and, oppreſſed by fortune and by rebels, which did not bend till after ſhe had decided in perſon twelve battles.

The warlike ſpirit among the women, conſiſtent with ages of barbariſm, when every thing is impetuous becauſe nothing is fixed, and when all exceſs is the exceſs of force, continued in Europe upwards of 400 years, ſhowing itſelf from time to time, and always in the middle of convulſions or on the eve of great revolutions. But there were æras and countries in which that ſpirit appeared with particular luſtre. Such were the diſplays it made in the 15th and 16th centuries in Hungary, and in the iſlands of the Archipelago and the Mediterranean when they were invaded by the Turks.

Among the ſtriking inſtances of Amazonian conduct in modern ladies, may be mentioned that of Jane of Belleville, widow of Monſ. de Cliſſon, who was beheaded at Paris in the year 1343, on a ſuſpicion of carrying on a correſpondence with England and the Count de Montfort. This lady, filled with grief for the death of her late huſband, and exaſperated at the ill treatment which ſhe conſidered him as having received, ſent off "her ſon ſecretly to London; and when her apprehenſions were removed with reſpect to him, ſhe ſold her jewels, fitted out three ſhips, and put to ſea, to revenge the death of her huſband upon all the French with whom ſhe ſhould meet. This new corſair made ſeveral deſcents upon Normandy, where ſhe ſtormed caſtles; and the inhabitants of that province were ſpectators more than once, whilſt their villages were all in a blaze, one of the fineſt women in Europe, with a ſword in one hand and a torch in the other, urging the carnage, and eyeing with pleaſure all the horrors of war."

We read in Mezery, under the article of the Croiſade, preached by St Barnard in the year 1147, "That many women did not content themſelves with taking the croſs, but that they alſo took up arms to defend it, and compoſed ſquadrons of females, which rendered credible all that has been ſaid of the proweſs of the Amazons."

In the year 1590, the League party obtained ſome troops from the king of Spain. Upon the news of their being diſembarked, Barri de St Aunez, Henry IV's governor at Leucate, ſet out to communicate a ſcheme to the Duke de Montmorenci, commander in that province. He was taken on his way by ſome of the troops of the League, who were alſo upon their march with the Spaniards towards Leucate. They were perſuaded, that by thus having the governor in their hands the gates of that place would be immediately opened to them, or at leaſt would not hold out long. But Conſtantia de Cecelli, his wife, after having aſſembled the garriſon, put herſelf ſo reſolutely at their head, pike in hand, that ſhe inſpired the weakeſt with courage; and the beſiegers were repulſed whereever they preſented themſelves. Shame and their great loſs having rendered them deſperate, they ſent a meſſage to this courageous woman, acquainting her, that if ſhe continued to defend herſelf they would hang her huſband. She replied with tears in her eyes, "I have riches in abundance: I have offered them, and I do ſtill offer them, for his ranſom; but I would not ignominiouſly purchaſe a life which he would reproach me with, and which he would be aſhamed to enjoy. I will not diſhonour him by treaſon againſt my king and country." The beſiegers having made a freſh attack without ſucceſs, put her huſband to death, and raiſed the ſiege. Henry IV. afterwards ſent to this lady the brevet of governeſs of Leucate, with the reverſion for her ſon.

The famous Maid of Orleans, alſo, is an example known to every reader.

The Abbé Arnaud, in his Memoirs, ſpeaks of a Counteſs of St Balmont, who uſed to take the field with her huſband and fight by his ſide. She ſent ſeveral Spaniſh priſoners of her taking to Marſhal Feuquiers; and what is not a little extraordinary, this Amazon at home was all affability and ſweetneſs, and gave herſelf up to reading and acts of piety.

Dr Johnſon ſeems to have given ſome credit to the accounts which have been tranſmitted down to us concerning the ancient Amazons; and he has endeavoured to ſhow, that we ought not haſtily to reject ancient hiſtorical narrations becauſe they contain facts repugnant to modern manners, and exhibit ſcenes to which nothing now occurring bears a reſemblance. "Of what we know not (ſays he) we can only judge by what we know. Every novelty appears more wonderful as it is more remote from any thing with which experience or teſtimony have hitherto acquainted us; and if it paſſes farther, beyond the notions that we have been accuſtomed to form, it becomes at laſt incredible. We ſeldom conſider, that human knowledge is very narrow; that national manners are formed by chance; that uncommon conjunctures of cauſes produce rare effects; or that what is impoſſible at one time or place may yet happen in another. It is always eaſier to deny than to enquire. To refuſe credit confers for a moment an appearance of ſuperiority which every little mind is tempted to aſſume, when it may be gained ſo cheaply as by withdrawing attention from evidence, and declining the fatigue of comparing probabilities. Many relations of travellers have been ſlighted as fabulous, till more frequent voyages have confirmed their veracity; and it may reaſonably be imagined, that many ancient hiſtorians are unjuſtly ſuſpected of falſehood, becauſe our own times afford nothing that reſembles what they tell. Few narratives will either to men or women appear more incredible than the hiſtories of the Amazons; of female nations, of whoſe conſtitution it was the eſſential and fundamental law, to exclude men from all participation either of public affairs or domeſtic buſineſs; where female armies marched under female captains, female farmers gathered the harveſt, female partners danced together, and female wits diverted one another. Yet ſeveral ages of antiquity have tranſmitted accounts of the Amazons of Caucaſus; and, the Amazons of America, who have given their name to the greateſt river in the world, Condamine lately found ſuch memorials as can be expected among erratic and unlettered nations, where events are recorded only by tradition, and new ſwarms ſettling in the country from time to time confuſe and efface all traces of former times."

No author has taken ſo much pains upon this ſubject as Dr Petit. But, in the courſe of his work, he has given it as his opinion, that there is great difficulty in governing the women even at preſent, though they are unarmed and unpractiſed in the art of war. After all his elaborate inquiries and diſcuſſions therefore, this learned writer might probably think, that it is not an evil of the firſt magnitude that the race of Amazons now ceaſes to exiſt.

Rouſſeau ſays, " The empire of the woman is an empire of ſoftneſs, of addreſs, of complacency. Her commands are careſſes, her menaces are tears." But the empire of the Amazons was certainly an empire of a very different kind. Upon the whole, we may conclude with Dr Johnſon: " The character of the ancient Amazons was rather terrible than lovely. The hand could not be very delicate that was only employed in drawing the bow and brandiſhing the battle-axe. Their power was maintained by cruelty, their courage was deformed by ferocity; and their example only ſhows, that men and women live beſt together."

AMAZONS (the river of), in America. See AMAZONIA.

AMAZONIAN Habit, in antiquity, denotes a dreſs formed in imitation of the Amazons. Marcia, the famous concubine of the emperor Commodus, had the appellation of *Amazonian*, becauſe ſhe charmed him moſt in a habit of this kind. Hence alſo that prince himſelf engaged in combat in the amphitheatre in an Amazonian habit; and of all titles the *Amazonius* was one of thoſe he moſt delighted in.—In honour either of the gallant or his miſtreſs, the month of December was alſo denominated *Amazonius*—Some alſo apply *Amazonian habit* to the hunting-dreſs worn by many ladies among us.

AMBA, an Abyſſinian or Ethiopic word, ſignifying a *rock*. The Abyſſinians give names to each of their rocks, as *Amba-Dorho*, the rock of a hen, &c. Some of theſe rocks are ſaid to have the name of *Aorni*; and are of ſuch a ſtupendous height, that the Alps and Pyrenees are but low hills in compariſon of them. Amongſt the mountains, and even frequently in the plains, of this country, ariſe ſteep and craggy rocks of various forms, ſome reſembling towers, others pyramids, &c. ſo perpendicular and ſmooth on the ſides, that they ſeem to be works of art; inſomuch, that men, cattle, &c. are craned up by the help of ladders and ropes: and yet the tops of theſe rocks are covered with woods, meadows, fountains, fiſh-ponds, &c. which very copiouſly ſupply the animals ſeated thereon with all the conveniencies of life. The moſt remarkable of theſe rocks is called *Amba-Geſhen*. It is prodigiouſly ſteep, in the form of a caſtle built of free ſtone, and almoſt impregnable. Its ſummit is about half a Portugueſe league in breadth, and the circumference at the bottom about half a day's journey. The aſcent at firſt is eaſy; but grows afterwards ſo ſteep, that the Abyſſine oxen, which will otherwiſe clamber like goats, muſt be craned up, and let down with ropes. Here the princes of the blood were formerly confined, in low cottages amongſt ſhrubs and wild cedars, with an allowance barely ſufficient to keep them alive. There is, according to Kircher, in this country, a rock ſo curiouſly hollowed by nature, that at a diſtance it reſembles a looking-glaſs; and oppoſite to this another, on the top of which nothing can be ſo ſoftly whiſpered but it may be heard a great way off. Between many of theſe rocks and mountains are vaſt abyſſes which appear very dreadful to the eye.

AMBACHT, in topography, denotes a kind of juriſdiction or territory, the poſſeſſor whereof has the adminiſtration of juſtice both in *alto* and *baſſo*; or of what is called in the Scots law *a power of pit and gallows*, i. e. a power of drowning and hanging.—In ſome ancient writers, ambacht is particularly uſed for the juriſdiction, government, or chief magiſtracy of a city. The word is very ancient, though uſed originally in a ſenſe ſomewhat different. Ennius calls a mercenary, or ſlave hired for money, *ambactus*; and Cæſar gives the ſame appellation to a kind of dependents among the Gauls, who, without being ſlaves, were attached to the ſervice of great lords.

AMBAGES. See CIRCUMLOCUTION.

AMBARVALIA, in antiquity, a ceremony among the Romans, when, in order to procure from the gods an happy harveſt, they conducted the victims thrice round the corn-fields in proceſſion, before ſacrificing them.—*Ambarvalia* were either of a private or public nature: the private were performed by the maſter of a family; and the public by the prieſts who officiated at the ſolemnity, called *fratres ovales*. The prayer preferred on this occaſion, the formula of which we have in Cato *de Re Ruſtica*, cap. cxlii. was called *carmen ambervale*. At theſe feaſts they ſacrificed to Ceres a ſow, a ſheep, and a bull or heifer, whence they took the name of *ſuovetaurilia*. The method of celebrating them was, to lead a victim round the fields, while the peaſants accompanied it, and one of their number, crowned with oak, hymned forth the praiſes of Ceres, in verſes compoſed on purpoſe. This feſtival was celebrated twice a-year; at the end of January, according to ſome, or in April, according to others; and for the ſecond time, in the month of July.

AMBASSADOR, or EMBASSADOR, a public miniſter ſent from one ſovereign prince, as a repreſentative of his perſon to another.

Ambaſſadors are either ordinary or extraordinary. Ambaſſador *in ordinary*, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Till about two hundred years ago, ambaſſadors in ordinary were not heard of: all, till then, were ambaſſadors *extraordinary*; that is, ſuch as are ſent on ſome extraordinary occaſion, and who retire as ſoon as the affair is diſpatched.

By the law of nations, none under the quality of a ſovereign prince can ſend or receive an ambaſſador. At Athens, ambaſſadors mounted the pulpit of the public orators, and there opened their commiſſion, acquainting the people with their errand. At Rome, they were introduced to the ſenate, and delivered their commiſſions to the fathers.

Ambaſſadors ſhould never attend any public ſolemnities, as marriages, funerals, &c. unleſs their maſters have ſome intereſt therein: nor muſt they go into mourning on any occaſions of their own, becauſe they repreſent the perſon of their prince. By the civil law, the moveable goods of an ambaſſador, which are accounted an acceſſion to his perſon, cannot be ſeized on, neither as a pledge, nor for payment of a debt, nor by order or execution of judgment, nor by the king's or ſtate's leave where he reſides, as ſome conceive; for all actions ought to be far from an ambaſſador, as well that which toucheth his neceſſaries, as his perſon: if, therefore he hath contracted any debt he is to be called upon kindly; and if he refuſes, then letters of requeſt are to go to his maſter. Nor can any of the ambaſſador's domeſtic ſervants that are regiſtered in the ſecretaries of ſtate's office be arreſted in perſon or goods; if they are, the proceſs ſhall be void, and the parties ſueing out and executing it ſhall ſuffer and be liable to ſuch penalties and corporal puniſhment as the lord chancellor or either of the chief juſtices ſhall think fit to inflict. Yet ambaſſadors cannot be defended when they commit any thing againſt that ſtate, or the perſon of the prince, with whom they reſide; and if they are guilty of treaſon, felony, &c. or any other crime againſt the law of nations, they loſe the privilege of an ambaſſador, and may be ſubject to puniſhment as private aliens.

AMBE, in *ſurgery*, the name of an inſtrument for reducing diſlocated bones. In *anatomy*, a term for the ſuperficial jutting out of a bone.

AMBER *(Succinum)*, in natural hiſtory, a ſolid, hard, ſemipellucid, bituminous ſubſtance of a particular nature, of uſe in medicine and in ſeveral of the arts. It has been called *ambra* by the Arabians, and *electrum* by the Greeks.

Amber has been of great repute in the world from the earlieſt times. Many years before Chriſt it was in eſteem as a medicine; and Plato, Ariſtotle, Herodotus, Æſchylus, and others, have commended its virtues. In the times of the Romans it became in high eſteem as a gem; and in the luxurious reign of Nero, immenſe quantities of it were brought to Rome, and uſed for ornamenting works of various kinds.

The moſt remarkable property of this ſubſtance is, that, when rubbed, it draws or attracts other bodies to it: and this, it is obſerved, it does, even to thoſe ſubſtances which the ancients thought it had an antipathy to, as oily bodies, drops of water, human ſweat, &c. Add, that by the friction it is brought to yield light pretty copiouſly in the dark; whence it is reckoned among the native phoſphori.

The property which amber poſſeſſes of attracting light bodies, was very anciently obſerved. Thales of Miletus, 600 years before Chriſt, concluded from hence that it was animated. But the firſt perſon who expreſsly mentions this ſubſtance, is Theophraſtus, about the year 300 before Chriſt. The attractive property of amber is likewiſe occaſionally taken notice of by Pliny, and other later naturaliſts, particularly by Gaſſendus, Kenelm Digby, and Sir Thomas Brown, but it was generally apprehended that this quality was peculiar to amber and jet, and perhaps agate, till Gilbert publiſhed his treatiſe *De Magnete*, in the year 1600. From ηλεκτρον, the Greek name for amber, is derived the term *Electricity*, which is now very extenſively applied not only to the power of attracting light bodies inherent in amber, but to other ſimilar powers and their various effects, in whatever bodies they reſide, or to whatever bodies they may be communicated.

Amber aſſumes all figures in the ground; that of a pear, an almond, a pea, &c. In amber there have been ſaid to be letters found very well formed; and even Hebrew and Arabic characters.—Within ſome pieces, leaves, inſects, &c. have likewiſe been found included; which ſeems to indicate, either that the amber was originally in a fluid ſtate, or that having been expoſed to the ſun, it was once ſoftened, and rendered ſuſceptible of the leaves, inſects, &c. which came in its way. The latter of theſe ſuppoſitions ſeems the more agreeable to the phenomenon, becauſe thoſe inſects, &c. are never found in the centre of the pieces of amber, but always near the ſurface. It is obſerved by the inhabitants of thoſe places where amber is produced, that all animals, whether terreſtrial, aerial, or aquatic, are extremely fond of it, and that pieces of it are frequently found in their excrements. The bodies of inſects, found buried in amber, are viewed with admiration by all the world; but of the moſt remarkable of theſe, many are to be ſuſpected as counterfeit, the great price at which beautiful ſpecimens of this kind ſell, having tempted ingenious cheats to introduce animal bodies in ſuch artful manners into ſeemingly whole pieces of amber, that it is not eaſy to detect the fraud.

Of thoſe inſects which have been originally incloſed in amber, ſome are plainly ſeen to have ſtruggled hard for their liberty, and even to have left their limbs behind them in the attempt; it being no unuſual thing to ſee, in a maſs of amber that contains a ſtout beetle, the animal wanting one, or perhaps two of its legs; and thoſe legs left in different places, nearer that part of the maſs from which it has travelled. This alſo may account for the common accident of finding legs, or wings of flies, without the reſt of their bodies, in pieces of amber; the inſects having, when entangled in the yet ſoft and viſcid matter, eſcaped, at the expence of leaving thoſe limbs behind them. Drops of clear water ſometimes are alſo preſerved in amber. Theſe have doubtleſs been received into it while ſoft, and preſerved by its hardening round them. Beautiful leaves of a pinnated ſtructure, reſembling ſome of the ferns, or maidenhairs, have been found in ſome pieces; but theſe are rare, and the ſpecimens of great value. Mineral ſubſtances are alſo found at times lodged in maſſes of amber. Some of the pompous collections of the German princes boaſt of ſpecimens of native ~~gold and~~ ſilver in maſſes of amber; but as there are many ſubſtances of the marcaſite, and other kinds, that have all the glittering appearance of gold and ſilver, it is not to be too haſtily concluded that theſe metals are really lodged in theſe beds of amber. Iron is found in various ſhapes immerſed in amber; and as it is often ſeen eroded, and ſometimes in the ſtate of vitriol, it is not impoſſible but that copper, and the other metals, may be alſo ſometimes immerſed in it in the ſame ſtate: hence the bluiſh and greeniſh colours, frequently found in the recent pieces of amber, may be owing, like the particles of the gem colours, to thoſe metals; but as the gems, by their denſe texture, always retain their colours, this lighter and more lax bitumen uſually loſes what it gets of this kind, by keeping ſome time. Small pebbles, grains of ſand, and fragments of other ſtones, are not unfrequently alſo found immerſed in amber.

Naturaliſts have been greatly divided as to the origin of this ſubſtance, and what claſs of bodies it belongs to; ſome referring it to the vegetable, others to the mineral, and ſome even to the animal kingdom. Pliny deſcribes it as "a reſinous juice, oozing from aged pines and firs (others ſay from poplars, whereof there are whole foreſts on the coaſts of Sweden), and diſcharged thence into the ſea, where, undergoing ſome alteration, it is thrown, in this form, upon the ſhores of Pruſſia, which lie very low: he adds, that it was hence the ancients gave it the denomination *ſuccinum*; from *ſuccus*, juice."

Some ſuppoſe amber a compound ſubſtance. Pruſſia, ſay they, and the other countries which produce amber, are moiſtened with a bituminous juice, which mixing with the vitriolic ſalts abounding in thoſe places, the points of theſe ſalts fix its fluidity, whence it congeals: and the reſult of that congelation makes what we call amber; which is more or leſs pure, tranſparent, and firm, as thoſe parts of ſalt and bitumen are more or leſs pure, and are mixed in this or that proportion.

Mr Brydone, in his tour to Sicily and Malta, ſays, that the river Gearetta, formerly celebrated by the poets under the name of Simetus, throws up near its mouth great quantities of amber. He mentions alſo a kind of artificial amber, not uncommon there, made, as he was told, from copal, but very different from the natural.

According to Hartman, amber is formed of a bitumen, mixed with vitriol and other ſalts. But though this were allowed him, in regard to the foſſile amber, many diſpute whether the ſea-amber be ſo produced. It is, however, apparent, that all amber is of the ſame origin, and probably that which is found in the ſea has been waſhed thither out of the cliffs; though Hartman thinks it very poſſible, that ſome of it may be formed in the earth under the ſea, and be waſhed up thence. The ſea-amber is uſually finer to the eye than the foſſile; but the reaſon is, that it is diveſted of that coarſe coat with which the other is covered while in the earth.

Upon the whole, it ſeems generally agreed upon, that amber is a true bitumen of foſſile origin.—In a late volume of the *Journal de Phyſique*, however, we find it aſſerted by Dr Girtanner to be an animal product, a ſort of honey or wax formed by a ſpecies of large ant called by Linnæus *formica rufa*. Theſe ants, our author informs us, inhabit the old pine foreſts, where they ſometimes form hills about ſix feet in diameter; and it is generally in theſe ancient foreſts, or in places where they have been, that foſſile amber is found. This ſubſtance is not hard as that which is taken up in the ſea at Pruſſia, and which is well known to naturaliſts. It has the conſiſtence of honey or of half melted wax, but it is of a yellow colour like common amber; it gives the ſame product by chemical analyſis, and it hardens like the other when it is ſuffered to remain ſome time in a ſolution of common ſalt. This accounts for the inſects that are ſo often found incloſed in it. Among theſe inſects ants are always the moſt prevailing; which tends farther, Mr Girtanner thinks, to the confirmation of his hypotheſis. Amber then, in his opinion, is nothing but a vegetable oil rendered concrete by the acid of ants, juſt as wax is nothing but an oil hardened by the acid of bees; a fact inconteſtibly proved, we are told, ſince Mr Metherie has been able to make artificial wax by mixing oil of olives with the nitrous acid, and which wax is not to be diſtinguiſhed from the natural.

There are ſeveral indications which diſcover where amber is to be found. The ſurface of the earth is there covered with a ſoft ſcaly ſtone; and vitriol in particular always abounds there, which is ſometimes found white, ſometimes reduced into a matter, like melted glaſs, and ſometimes figured like petrified wood.

Amber of the fineſt kind has been found in England. It is frequently thrown on the ſhores of Yorkſhire, and many other places, and found even in the clay-pits; the pits dug for tile-clay, between Tyburn and Kenſington gravel-pits, and that behind St George's Hoſpital at Hyde-park corner, have afforded fine ſpecimens.

Poland, Sileſia, and Bohemia, are famous for the amber dug up there at this time. Germany affords great quantities of amber, as well dug up from the bowels of the earth, as toſſed about on the ſhores of the ſea and rivers there. Saxony, Miſnia, and Sweden, and many other places in this tract of Europe, abound with it. Denmark has afforded, at different times, ſeveral quantities of foſſile amber; and the ſhores of the Baltic abound with it. But the countries lying on the Baltic afford it in the greateſt abundance of all; and of theſe the moſt plentiful country is Pruſſia, and the next is Pomerania. Pruſſia was, as early as the times of Theodoric the Goth, famous for amber; for this ſubſtance coming into great repute with that prince, ſome natives of Pruſſia, who were about his court, offered their ſervice to go to their own country, where that ſubſtance, they ſaid, was produced, and bring back great ſtores of it. They accordingly did ſo; and from this time Pruſſia had the honour to be called the Country of Amber, inſtead of Italy, which had before undeſervedly that title. This article alone brings his Pruſſian Majeſty a revenue of 26,000 dollars annually. The amber of Pruſſia is not only found on the ſea-coaſts, but in digging; and though that of Pomerania is generally brought from the ſhores, yet people who dig, on different occaſions, in the very heart of the country, at times find amber.

Junker deſcribes, after Neumann, the Pruſſian amber-mines, which are the richeſt known.—Firſt, at the ſurface of the earth, is found a ſtratum of ſand. Immediately under this ſand is a bed of clay, filled with ſmall flints of about an inch diameter each. Under this clay lies a ſtratum of black earth, or turf, filled with foſſile wood half decompoſed, and bituminous; this ſtratum is extended upon a bank of minerals, containing little metal, except iron, which are conſequently pyrites. Laſtly, under this bed the amber is found, ſcattered about in pieces, or ſometimes accumulated in heaps.

Amber has a ſubacrid reſinous taſte, and fragrant aromatic ſmell, eſpecially when diſſolved. It differs from the other bituminous ſubſtances in this, that it yields by diſtillation a volatile acid ſalt, which none of the others do; otherwiſe it affords the ſame ſort of principles as them, viz. an acid phlegm, an oil which gradually becomes thicker as the diſtillation is continued; and when the operation is finiſhed, there remains a black caput mortuum in the retort.—When boiled in water, it neither ſoftens nor undergoes any ſenſible alteration. Expoſed to the fire in an open veſſel, it melts into a black maſs very like a bitumen: It is partly ſoluble in ſpirit of wine, and likewiſe in ſome eſſential oils; but it is with difficulty that the expreſſed ones are brought to act upon it; the ſtronger ſorts of fixed alkaline lixivia almoſt totally diſſolve it.

This ſubſtance is principally of two colours, white and yellow. The white is the moſt eſteemed for medicinal purpoſes, as being the moſt odoriferous, and containing the greateſt quantity of volatile ſalt; though the yellow is moſt valued by thoſe who manufacture beads and other toys with it, by reaſon of its tranſparency.

Amber is the baſis of all varniſhes, by ſolution in the ways deſcribed under the article VARNISH.

Amber, when it has once been melted, irrecoverably loſes its beauty and hardneſs. There have been ſome, however, who pretended they had an art of melting ſome ſmall pieces of amber into a maſs, and conſtituting large ones of them: but this ſeems ſuch another undertaking as the making of gold; all the trials that have yet been made by the moſt curious experimenters, proving that the heat which is neceſſary to melt amber, is ſufficient to deſtroy it. Phil. Tranſ. N°. 248. p. 25.

Could amber indeed be diſſolved without impairing its tranſparency, or one large maſs be made of it by uniting ſeveral ſmall ones, it is eaſy to ſee what would be the advantages of ſuch a proceſs. The art of embalming might poſſibly be alſo carried to a great height by this, if we could preſerve the human corpſe in a tranſparent caſe of amber, as the bodies of flies, ſpiders, graſhoppers, &c. are to a great perfection. Something of a ſubſtitute of this kind we have in fine roſin; which being diſſolved by heat, and the bodies of ſmall animals ſeveral times dipped in it, they are thus coated with colophony, that in ſome degree reſembles amber: but this muſt be kept from duſt.

Amber in ſubſtance has been much recommended as a nervous and cordial medicine; and alledged to be very efficacious in promoting the menſtrual diſcharge, and the excluſion of the fœtus and ſecundines in labour: but as in its crude ſtate it is quite inſoluble by our juices, it certainly can have very little effect on the animal ſyſtem, and therefore it is now ſeldom given in ſubſtance. The forms in which amber is prepared are, a tincture, a ſalt, and an oil; the preparation and uſes of which are deſcribed in the proper place under the article PHARMACY.

AMBER-Tree, the Engliſh name of a ſpecies of ANTHOSPERMUM.

AMBERG, a city of Germany, the capital of the palatinate of Bavaria, with a good caſtle, ramparts, baſtions, and deep ditches. It is ſeated near the confines of Franconia, on the river Wils. It drives a great trade in iron and other metals, found in the neighbouring mountains. E. Long. 12. 4. N. Lat. 20. 46.

AMBERGRISE, AMBERGREASE, or GREY AMBER, in natural hiſtory, is a ſolid, opake, aſh-coloured, fatty inflammable ſubſtance, variegated like marble, remarkably light, rugged and uneven in its ſurface, and has a fragrant odour when heated. It does not effervеſce with acids; it melts freely over the fire, into a kind of yellow roſin; and is hardly ſoluble in ſpirit of wine.

It is found ſwimming upon the ſea, or the ſea-coaſt, or in the ſand near the ſea-coaſt: eſpecially in the Atlantic ocean, on the ſea-coaſt of Braſil, and that of Madagaſcar; on the coaſt of Africa, of the Eaſt Indies, China, Japan, and the Molucca iſlands; but moſt of the ambergriſe which is brought to England comes from the Bahama iſlands, from Providence, &c. where it is found on the coaſt. It is alſo ſometimes found in the abdomen of whales by the whale-fiſhermen, always in lumps of various ſhapes and ſizes, weighing from half an ounce to an hundred and more pounds. The piece which the Dutch Eaſt India Company bought from the king of Tydor, weighed 182 pounds. An American fiſherman from Antigua found ſome years ago, about 52 leagues ſouth-eaſt from the Windward Iſlands, a piece of ambergriſe in a whale, which weighed about 130 pounds, and ſold for 500l. Sterling.

There have been many different opinions concerning the origin of this ſubſtance.

It has been ſuppoſed to be a foſſile bitumen or naphtha, exuding out of the bowels of the earth in a fluid form, and diſtilling into the ſea, where it hardens and floats on the ſurface. But having been frequently found in the belly of whales, it has by others been conſidered as entirely an animal production.

Cluſius aſſerted it to be a phlegmatic recrement, or indurated indigeſtible part of the food, collected and found in the ſtomach of the whale, in the ſame manner as the BEZOARS are found in the ſtomachs of other animals.

In an account communicated by Paul Dudley, Eſq; in the 23d volume of the Philoſophical Tranſactions, the ambergriſe found in whales is repreſented as a kind of animal product, like muſk, and caſtoreum, &c. ſecreted and collected in a peculiar bag or bladder, which is furniſhed with an excretory duct or canal, the ſpout of which runs tapering into and through the length of the penis; and that this bag, which lies juſt over the teſticles, is almoſt full of a deep orange-coloured liquor, not quite ſo thick as oil, of the ſame ſmell as the balls of ambergriſe, which float and ſwim looſe in it: which colour and liquor may alſo be found in the canal of the penis; and that therefore ambergriſe is never to be found in any female, but in the male only. But theſe circumſtances are not only deſtitute of truth, but alſo contrary to the laws of the animal œconomy: For, in the firſt place, ambergriſe is frequently found in females as well as males; although that found in females is never in ſuch large pieces, nor of ſo good a quality, as what is found in males. Secondly, No perſon who has the leaſt knowledge in anatomy or phyſiology, will ever believe that organiſed bodies, ſuch as the beaks of the Sepia, which are ſo conſtantly found in ambergriſe taken out of the whale, can have been abſorbed from the inteſtines by the lacteals or lymphatics, and collected with the ambergriſe in the peculiar bag above mentioned.

Kæmpfer, who has given us ſo many other faithful accounts in natural hiſtory, ſeems to come nearer the truth with regard to the origin of ambergriſe, when he ſays, that it is the dung of the whale; and that the Japaneſe, for this reaſon, call it *kuſura no fuu*, i.e. whale's dung. This account, however, though founded on obſervation, has never obtained credit, but has been conſidered rather as a fabulous ſtory, with which the Japaneſe impoſed upon him, who had himſelf no direct obſervation to prove the fact.

This matter, therefore, remained a ſubject of great doubt; and it was generally thought to be more probable, that ambergriſe, after having been ſwallowed, and ſomehow or other changed in the ſtomach and bowels of the whale, was found among its excrements.

But the moſt ſatisfactory account of the real origin of ambergriſe, is that given by Dr Swediar in the 73d volume of the Philoſophical Tranſactions, art. 15.

We are told by all writers on ambergriſe, that ſometimes claws and beaks of birds, feathers of birds, parts of vegetables, ſhells, fiſh, and bones of fiſh, are found in the middle of it, or variouſly mixed with it. Of a very large quantity of pieces, however, which the Doctor examined, he found none that contained any ſuch thing; though he allows, that ſuch ſubſtances may ſometimes be found in it; but in all the pieces of any conſiderable ſize, whether found on the ſea or in the whale, he conſtantly found a conſiderable quantity of black ſpots, which, after the moſt careful examination, appeared to be the beaks of the *Sepia Octopodia*; and theſe beaks, he thinks, might be the ſubſtances which have hitherto been always miſtaken for claws or beaks of birds, or for ſhells.

The preſence of theſe beaks in ambergriſe proves evidently, that all ambergriſe containing them is in its origin, or muſt have been once, of a very ſoft or liquid nature, as otherwiſe thoſe beaks could not ſo conſtantly be intermixed with it throughout its whole ſubſtance.

That ambergriſe is found either upon the ſea and ſea-coaſt, or in the bowels of whales, is a matter of fact univerſally credited. But it has never been examined into and determined, whether the ambergriſe found upon the ſea and ſea-coaſt is the ſame as that found in the whale, or whether they are different from one another? Whether that found on the ſea or ſea-coaſt has ſome properties, or conſtituent parts, which that found in the whale has not? And laſtly, Whether that found in the whale is ſuperior or inferior in its qualities and value to the former?

It is likewiſe a matter of conſequence to know, Whether ambergriſe is found in all kinds of whales, or only in a particular ſpecies of them? Whether it is conſtantly and always to be met with in thoſe animals? And, if ſo, in what part of their body is it to be found?

All theſe queſtions we find very ſatisfactorily diſcuſſed by Dr Swediar.

According to the beſt information that he could obtain from ſeveral of the moſt intelligent perſons employed in the ſpermaceti whale-fiſhery, and in procuring and ſelling ambergriſe, it appears, that this ſubſtance is ſometimes found in the belly of the whale, but in that particular ſpecies only which is called the *ſpermaceti whale*, and which from its deſcription and delineation appears to be the *Physeter Macrocephalus* Linnæi.

The New England fiſhermen, according to their account, have long known that ambergriſe is to be found in the ſpermaceti whale; and they are ſo convinced of this fact, that whenever they hear of a place where ambergriſe is found, they always conclude that the ſeas in that part are frequented by this ſpecies of whale.

The perſons who are employed in the ſpermaceti whale-fiſhery, confine their views to the Phyſeter macrocephalus. They look for ambergriſe in all the ſpermaceti whales they catch, but it ſeldom happens that they find any. Whenever they hook a ſpermaceti whale, they obſerve, that it conſtantly not only vomits up whatever it has in its ſtomach, but alſo generally diſcharges its fæces at the ſame time; and if this latter circumſtance takes place, they are generally diſappointed in finding ambergriſe in its belly. But whenever they diſcover a ſpermaceti whale, male or female, which ſeems torpid and ſickly, they are always pretty ſure to find ambergriſe, as the whale in this ſtate ſeldom voids its fæces upon being hooked. They likewiſe generally meet with it in the dead ſpermaceti whales, which they ſometimes find floating on the ſea. It is obſerved alſo, that the whale, in which they find ambergriſe, often has a morbid protuberance; or, as they expreſs it, a kind of gathering in the lower part of its belly, in which, if cut open, ambergriſe is found. It is obſerved, that all thoſe whales, in whoſe bowels ambergriſe is found, ſeem not only torpid and ſick, but are alſo conſtantly leaner than others; ſo that, if we may judge from the conſtant union of theſe two circumſtances, it would ſeem that a large collection of ambergriſe in the belly of the whale is a ſource of diſeaſe, and probably ſometimes the cauſe of its death. As ſoon as they hook a whale of this deſcription, torpid, ſickly, emaciated, or one that does not dung on being hooked, they immediately either cut up the above-mentioned protuberance, if there be any, or they rip open its bowels from the orifice of the anus, and find the ambergriſe, ſometimes in one ſometimes in different lumps, of generally from three to twelve and more inches in diameter, and from one pound to twenty or thirty pounds in weight, at the diſtance of two, but moſt frequently of about ſix or ſeven feet from the anus, and never higher up in the inteſtinal canal; which, according to their deſcription, is, in all probability, the inteſtinum cæcum, hitherto miſtaken for a peculiar bag made by nature for the ſecretion and collection of this ſingular ſubſtance. That the part they cut open to come at the ambergriſe is no other than the inteſtinal canal is certain, becauſe they conſtantly begin their inciſion at the anus, and find the cavity everywhere filled with the fæces of the whale, which from their colour and ſmell it is impoſſible for them to miſtake. The ambergriſe found in the inteſtinal canal is not ſo hard as that which is found on the ſea or ſea-coaſt, but ſoon grows hard in the air: when firſt taken out it has nearly the ſame colour, and the ſame diſagreeable ſmell, though not ſo ſtrong, as the more liquid dung of the whale has; but, on expoſing it to the air, it by degrees not only grows greyiſh, and its ſurface is covered with a greyiſh duſt like old chocolate, but it alſo loſes its diſagreeable ſmell, and, when kept for a certain length of time, acquires the peculiar odour which is ſo agreeable to moſt people.

The gentlemen the Doctor converſed with confeſſed, that if they knew not from experience that ambergriſe thus found will in time acquire the above-mentioned

Ambergriſe.

Ambergriſe.

qualities, they would by no means be able to diſtinguiſh ambergriſe from hard indurated fæces. This is ſo true, that whenever a whale voids its fæces upon being hooked, they look carefully to ſee if they cannot diſcover among the more liquid excrements (of which the whale diſcharges ſeveral barrels) ſome pieces floating on the ſea, of a more compact ſubſtance than the reſt; theſe they take up and waſh, knowing them to be ambergriſe.

In conſidering whether there be any material difference between ambergriſe found upon the ſea or ſea-coaſt, and that found in the bowels or among the dung of the whale, the Doctor refutes the opinion, that all ambergriſe found in whales is of an inferior quality, and therefore much leſs in price. Ambergriſe, he obſerves, is only valued for its purity, lightneſs, compactneſs, colour, and ſmell. There are pieces of ambergriſe found on different coaſts, which are of a very inferior quality; whereas there are often found in whales pieces of it of the firſt value; nay, ſeveral pieces found in the ſame whale, according to the above-mentioned qualities, are more or leſs valuable. All ambergriſe found in whales has at firſt when taken out of the inteſtines very near the ſame ſmell as the liquid excrements of that animal have; it has then alſo nearly the ſame blackiſh colour: they find it in the whale ſometimes quite hard, ſometimes rather ſoftiſh, but never ſo liquid as the natural fæces of that animal. And it is a matter of fact, that, after being taken out and kept in the air, all ambergriſe grows not only harder and whiter but alſo loſes by degrees its ſmell, and aſſumes ſuch an agreeable one, as that in general has which is found ſwimming upon the ſea; therefore the goodneſs of ambergriſe ſeems rather to depend on its age. By being accumulated after a certain length of time in the inteſtinal canal, it ſeems even then to become of a whiter colour, and leſs ponderous, and acquire its agreeable ſmell. The only reaſon why ambergriſe found floating on the ſea generally poſſeſſes the above-mentioned qualities in a ſuperior degree, is becauſe it is commonly older, and has been longer expoſed to the air. It is more frequently found in males than females; the pieces found in females are in general ſmaller, and thoſe found in males ſeem conſtantly to be larger and of a better quality; and therefore the high price in proportion to the ſize is not merely imaginary for the rarity-ſake, but in ſome reſpect well founded, becauſe ſuch large pieces appear to be of a greater age, and poſſeſs the above-mentioned qualities in general, in a higher degree of perfection than ſmaller pieces.

It is known, that the Sepia octopodia, or cuttle-fiſh, is the conſtant and natural food of the ſpermaceti whale, or Phyſeter macrocephalus. Of this the fiſhers are ſo well perſuaded, that whenever they diſcover any recent relics of it ſwimming on the ſea, they conclude that a whale of this kind is, or has been, in that part. Another circumſtance which corroborates the fact is, that the ſpermaceti whale on being hooked generally vomits up ſome remains of the Sepia. Hence it is eaſy to account for the many beaks, or pieces of beaks, of the Sepia found in all ambergriſe. The beak of the Sepia is a black horny ſubſtance, and therefore paſſes undigeſted through the ſtomach into the inteſtinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if theſe latter be preternaturally retained, forms concretions with them, which render the animal ſick and torpid, and produce an obſtipation, which ends either in an abſceſs of the abdomen, as has been frequently obſerved, or becomes fatal to the animal; whence in both the caſes, on the burſting of its belly, that hardened ſubſtance, known under the name of *ambergriſe*, is found ſwimming on the ſea, or thrown upon the coaſt.

From the preceding account, and his having conſtantly found the above-mentioned beaks of the Sepia in all pieces of ambergriſe of any conſiderable ſize, Dr Swediar concludes with great probability, that all ambergriſe is generated in the bowels of the Phyſeter macrocephalus, or ſpermaceti whale; and there mixed with the beaks of the Sepia octopodia, which is the principal food of that whale. He therefore defines ambergriſe to be the preternaturally hardened dung or fæces of the Phyſeter macrocephalus, mixed with ſome indigeſtible relics of its food.

The uſe of ambergriſe in Europe is now nearly confined to perfumery, though it has formerly been recommended in medicine by ſeveral eminent phyſicians. Hence the Eſſentia Ambræ Hoffmanni, Tinctura Regia Cod. Pariſini, Trochiſci de Ambra Ph. Wurtemberg, &c.

If we wiſh to ſee any medicinal effects from this ſubſtance, the Doctor obſerves, we muſt certainly not expect them from two or three grains, but give rather as many ſcruples of it for a doſe: though even then, he thinks, there would not be reaſon to expect much effect from it, as he had himſelf taken of pure unadulterated ambergriſe in powder 30 grains at once, without obſerving the leaſt ſenſible effect from it. A ſailor, however, who had the curioſity to try the effect of recent ambergriſe upon himſelf, took half an ounce of it melted upon the fire, and found it a good purgative; which proves that it is not quite an inert ſubſtance.

In Aſia and part of Africa ambergriſe is not only uſed as a medicine and as a perfume; but conſiderable uſe is alſo made of it in cookery, by adding it to ſeveral diſhes as a ſpice. A great quantity of it is alſo conſtantly bought by the pilgrims who travel to Mecca; probably to offer it there, and make uſe of it in fumigations, in the ſame manner as frankincenſe is uſed in Catholic countries. The Turks make uſe of it as an aphrodiſiac. Our perfumers add it to ſcented pillars, candles, balls or bottles, gloves, and hair-powder; and its eſſence is mixed with pomatums for the face and hands, either alone or mixed with muſk, &c. tho' its ſmell is to ſome perſons extremely offenſive.

Ambergriſe may be known to be genuine by its fragrant ſcent when a hot needle or pin is thruſt into it, and its melting like fat of an uniform conſiſtence; whereas the counterfeit will not yield ſuch a ſmell, nor prove of ſuch a fat texture.—One thing, however, is very remarkable, that this drug, which is the moſt ſweet of all the perfumes, ſhould be capable of being reſembled in ſmell by a preparation of one of the moſt odious of all ſtinks. Mr Homberg found, that a veſſel in which he had made a long digeſtion of the human fæces, acquired a very ſtrong and perfect ſmell of ambergriſe, inſomuch that any one would have thought a great quantity of eſſence of ambergriſe had been made in it. The perfume was ſo ſtrong and offenſive, that the veſſel was forced to be removed out of the elaboratory.

AMBERT, a ſmall town of France, in Lower Auvergne, the chief place of a ſmall territory called *Livradois*. It is remarkable for its paper manufactory and camblets. E. Long. 3. 35. N. Lat. 45. 28.

AMBETTUWAY, in botany, a barbarous name of a tree, the leaves of which, when boiled in wine, are ſaid to create an appetite, and is uſed by the people in Guinea with that intention.

AMBIANI, or AMBIANENSIS CIVITAS, now *Amiens*, a city of Picardy. It is called *Samarobriva* by Cæſar and Cicero; which, according to Valeſius, ſignifies the bridge of the *Samara* or *Somme*. *Ambiani* is a later name, taken from that of the people, after the uſual manner of the lower age.

AMBIDEXTER, a perſon who can uſe both hands with the ſame facility, and for the ſame purpoſes, that the generality of people do their right hands.—As to the natural cauſe of this faculty, ſome, as Hæfer, attribute it to an extraordinary ſupply of blood and ſpirits from the heart and brain, which furniſh both hands with the neceſſary ſtrength and agility: others, as Nicholas Maſſa, to an erect ſituation of the heart, inclining neither to the right hand nor left; and others to the right and left ſubclavian arteries being of the ſame height and the ſame diſtance from the heart, by which the blood is propelled with equal force to both hands.—But theſe are only conjectures, or rather chimeras. Many think, that, were it not for education and habit, all mankind would be ambidexters; and in fact, we frequently find nurſes obliged to be at a good deal of pains before they can bring children to forego the uſe of their left hands. How far it may be an advantage to be deprived of half our natural dexterity, may be doubted. It is certain, there are infinite occaſions in life, where it would be better to have the equal uſe of both hands. Surgeons and oculiſts are of neceſſity obliged to be ambidexters; bleeding, &c. in the left-arm or left-ancle, and operations on the left-eye, cannot be well performed but with the left-hand. Various inſtances occur in hiſtory, where the left hand has been exerciſed preferably to the right. But by the laws of the ancient Scythians, people were enjoined to exerciſe both hands alike; and Plato enjoins ambidexterity to be obſerved and encouraged in his republic.

AMBIDEXTER, among Engliſh lawyers, a juror or embracer, who accepts money of both parties, for giving his verdict; an offence for which he is liable to be impriſoned, forever excluded from a jury, and to pay ten times the ſum he accepted of.

AMBIENT, a term uſed for ſuch bodies, eſpecially fluids, as encompaſs others on all ſides: thus, the air is frequently called an ambient fluid, becauſe it is diffuſed round the earth.

AMBIGENÆ OVES, in the heathen ſacrifices, an appellation given to ſuch ewes as, having brought forth twins, were ſacrificed together with their two lambs, one on each ſide. We find them mentioned among other ſacrifices to Juno.

AMBIGENAL HYPERBOLA, a name given by Sir Iſaac Newton to one of the triple hyperbolas of the ſecond order, having one of its infinite legs falling within an angle formed by the aſymptotes, and the other without.

AMBIGUITY, a defect of language, whereby words are rendered ambiguous. See the next article.

AMBIGUOUS, a term applied to a word or expreſſion which may be taken in different ſenſes.—An anonymous writer has publiſhed a dictionary of ambiguous words: *Lexicon Philoſophicum de Ambiguitate Vocabulorum*, Francof. 1597. 4to.—The reſponſes of the ancient oracles were always ambiguous.

AMBIT, in geometry, is the ſame with what is otherwiſe called the perimeter of a figure. See PERIMETER.

AMBIT was particularly uſed, in antiquity, to denote a ſpace of ground to be left vacant betwixt one building and another. By the laws of the twelve tables, houſes were not to be be built contiguous, but an ambit or ſpace of 2½ feet was to be left about each for fear of fire.—The ambitus of a tomb or monument denoted a certain number of feet, in length and breadth, around the ſame, within which the ſanctity aſſigned to it was limited. The whole ground wherein a tomb was erected was not to be ſecreted from the common uſes; for this reaſon, it was frequent to inſcribe the ambit on it, that it might be known how far its ſanctity extended: thus, *in fronte pedes tot, in agrum pedes tot*.

AMBITION (*ambitio*), is generally uſed in a bad ſenſe, for an immoderate or illegal purſuit of power.

In the ſtrict meaning, however, of the word, it ſignifies the ſame with the *ambitus* of the Romans. See the next article.

Ambition, in the former and more uſual ſenſe, is one of thoſe paſſions that is never to be ſatiſfied. It ſwells gradually with ſucceſs, and every acquiſition ſerves but as a ſpur to further attempts.

“ If a man (it has been well obſerved) could at once accompliſh all his deſires, he would be a miſerable creature; for the chief pleaſure of this life is to wiſh and deſire. Upon this account, every prince who aſpires to be deſpotic, aſpires to die of wearineſs. Searching every kingdom for the man who has the leaſt comfort in life, Where is he to be found?—In the royal palace.—What! his majeſty? Yes; eſpecially if he be deſpotic.”

AMBITUS, in Roman antiquity, the ſetting up for ſome magiſtracy or office, and formally going round the city to ſolicit the intereſt and votes of the people.

Ambitus differed from *ambitio*, as the former lies in the act, the latter in the mind.

Ambitus was of two kinds; one lawful, the other infamous. The firſt, called alſo *ambitus popularis*, was when a perſon offered his ſervice to the republic frankly, leaving it to every body to judge of his pretenſions as they found reaſonable. The means and inſtruments here made uſe of were various. 1. *Amici*, or friends, under different relations, including *cognati, offines, neceſſarii, familiares, vicini, tribules, clientes, municipes, ſodales, collegæ*. 2. *Nomenclatura*, or the calling and ſaluting every perſon by his name; to which purpoſe, the candidates were attended with an officer, under the denomination of *intepres*, or *nomenclator*. 3. *Blanditia*; or obliging perſons, by ſerving them, or their friends, patrons, or the like, with their vote and intereſt on other occaſions. 4. *Prenſatio*; the ſhaking every perſon by the hand, offering him his ſervice, friendſhip, &c.—The ſecond kind was that wherein force, cajoling, money, or other extraordinary influence, was made uſe of. This was held infamous, and ſeverely puniſhed, as a ſource of corruption and other miſchiefs.

Ambitus was practiſed not only at Rome and in the forum, but in the meetings and aſſemblies of other towns in Italy, where numbers of citizens were uſually found, on account of trade and buſineſs.—The practice ceaſed in the city from the time of the emperors, by reaſon poſts were not then to be had by courting the people, but by favour from the prince.

Perſons who had cauſes depending practiſed the ſame, going about among the judges to implore their favour and mercy. They who practiſed this were called *Ambitioſi*. Hence we alſo meet with *ambitioſa decreta*, and *ambitioſa juſſa*, uſed for ſuch ſentences and decrees as were thus procured from the judges, contrary to reaſon and equity, either gratuitouſly or for money.

AMBLE, in horſemanſhip, a peculiar pace by which a horſe's two legs of the ſame ſide move at the ſame time. See HORSEMANSHIP.

AMBLESIDE, a town in Weſtmoreland, ſeated at one end of Winandermeer, W. Long. 0. 49. N. Lat. 54. 30.

AMBLETEUSE, a ſea-port town of France, in Picardy, defended with a battery of cannon. E. Long. 1. 30. N. Lat. 49. 40.

AMBLYGON, in geometry, denotes an obtuſe-angled triangle, or a triangle one of whoſe angles conſiſts of more than 90 degrees.

AMBLYOPY, among phyſicians, ſignifies an obſcuration of the ſight, ſo that objects at a diſtance cannot be clearly diſtinguiſhed.

AMBO, or AMBON, a kind of pulpit, or deſk, in the ancient churches, where the prieſts and deacons ſtood to read or ſing part of the ſervice, and preach to the people; called alſo *Analogium*. The term is derived from αναβαινειν, "to mount."—The ambo was mounted upon two ſides; whence ſome alſo derive the appellation from the Latin *ambo*, "both."

The ambo was aſcended by ſteps; which occaſioned that part of the office performed there to be called the *Gradual*. See GRADUAL.

Beſides the goſpel, which was read at the top of the ambo, and the epiſtle, which was read a ſtep lower, they likewiſe publiſhed from this place the acts of the martyrs, the commemoration of departed ſaints, and the letters of peace and communion ſent by one church to another; here, too, converts made a public profeſſion of their faith; and biſhops, their defence, when accuſed: treaties alſo were ſometimes concluded, and the coronations of emperors and kings performed, in the ſame place.

The modern reading-deſks and pulpits have been generally ſubſtituted to the ancient ambos; though, in ſome churches, remains of the ambos are ſtill ſeen. In that of St. John de Lateran at Rome, there are two moveable ambos.

AMBOHITSMENE, or VOHITSANGHOMBE, a province of the iſland of Madagaſcar, ſo called from ſome red mountains of the ſame name, lying in S. Lat. 20°. Theſe mountains are very high, reſembling the Tafelberg of the Cape of Good Hope. On one ſide of this ridge the ſea extends into the country for fifteen leagues; on the other is a flat country abounding in ponds and marſhes. Here is alſo a lake fifteen leagues in length, and the ſame in breadth, containing many ſmall iſlands. The inhabitants of the mountains are called *Zaferahongs*; and have plenty of gold, iron, cattle, ſilk, &c.

AMBOISE, a town of France, in Touraine, ſeated at the confluence of the rivers Loire and Maſſee. The town is mean and ill built; but has been rendered famous in hiſtory by the conſpiracy of the Proteſtants in 1560, which opened the fatal wars of religion in France. The caſtle is ſituated on a craggy rock, extremely difficult of acceſs, and the ſides of which are almoſt perpendicular. At its foot flows the Loire, which is divided into two ſtreams by a ſmall iſland. To this fortreſs the Duke of Guiſe, when he expected an inſurrection among the Hugonots, removed Francis II. as to a place of perfect ſecurity. Only two detached parts of the ancient caſtle now remain, one of which was conſtructed by Charles VIII. and the other by Francis I. The former of thoſe princes was born and died at Amboiſe. The town is ſituated E. Long. 1. 30. N. Lat. 47. 25.

AMBOULE, a province of Madagaſcar, ſomewhat to the northward of S. Lat. 23°. It is a fertile and agreeable country, watered by the river Manampani, whoſe mouth lies in S. Lat. 23. 30. The country produces plants and fruits in plenty. Iron mines are alſo found here. The black cattle are extremely fat, and their fleſh excellent. In this province ſtands a large town of the ſame name; near which is a fountain of hot water, within 20 feet of a ſmall river whoſe ſand is almoſt burning. The water of this fountain is ſaid to boil an egg hard in two hours; and the inhabitants affirm it to be a ſovereign remedy againſt the gout. The people here are employed in different preparations of iron and ſteel, which they have from their own mines, and forge ſeveral inſtruments with tolerable ſkill. Their governor is honoured with the title of *Rabertau*, or *Great Lord*. He exerciſes ſovereign authority and abſolute power; but is frequently, in times of diſtreſs, ſurpriſed by his ſubjects, who aſſemble in great numbers, ſeize his perſon, and threaten him with death unleſs they are relieved. To extricate himſelf from this dilemma, he is inſtantly obliged to iſſue orders for diſtributing proviſions among them; but is uſually repaid with intereſt, a quadruple return being made in a plentiful harveſt. The people of Amboule live in great licentiouſneſs with their ſuperiors, and their country is generally a retreat for the roguiſh and lazy.

AMBOYNA, one of the Molucca iſlands, in the Eaſt Indies. It lies in S. Lat. 3. 36. and E. Long. 126. 20. and is remarkable for being the centre of the commerce for nutmegs and cloves, which is entirely monopolized by the Dutch Eaſt-India company. It is about 24 leagues in circumference. Beſides cloves, it likewiſe abounds in moſt of the tropical fruits and fiſh; nor is there here any deficiency of good water; but fleſh is very ſcarce. This ſcarcity, however, proceeds more from the policy of the Dutch than either the intemperature of the climate or the barrenneſs of the ſoil; For, excepting cloves, they have in Amboyna, na, as well as the Moluccas, induſtriouſly diſcouraged the cultivation of every eſculent commodity, with the view of withholding ſubſiſtence from thoſe who might be tempted to invade them.

Of the natives, the men wear large whiſkers, but leave little hair upon their chin; and have only a ſlight piece of ſtuff wrapped round their middle. The women tie their hair in knots: the maids are bought of their fathers before they are married; and if the wife proves barren, the marriage is diſſolved. Some of the natives are Mahometans, and ſome Chriſtians: but they are all ſaid to be lazy, deceitful, and treacherous. They make war with ſmall ſwift veſſels, in ſhape like dragons with regard to the head and tail. Their houſes are built of bamboo-canes and ſago-trees. They ſleep on mats. Their weapons are bows and arrows, javelins, ſcymitars, and targets.

Amboyna was firſt diſcovered by the Portugueſe, who built a fort upon it, which was taken from them by the Dutch in 1605. They did not, however, become maſters of the whole iſland at once. The Engliſh had here five factories, which lived under the protection of the Dutch caſtle; holding themſelves ſafe, in reſpect of the friendſhip between the two nations. Great differences had ariſen between the Dutch and Engliſh coloniſts in this part of the world; till at laſt, the Engliſh Eaſt-India company applying to king James, a treaty was concluded in 1619, by which the concerns both of the Engliſh and Dutch were regulated, and certain meaſures agreed upon for preventing future diſputes. This was an additional ſecurity to the Engliſh; and, by virtue of the treaty, they continued two years in Amboyna, trading with the Dutch. During this time, however, ſeveral diſputes happened; which occaſioning mutual diſcontents, the complaints were ſent to Jaccatra, in the iſland of Java Major, to the council of defence of both nations there reſiding: but they not agreeing, a ſtate of the matter was ſent over to Europe, to be decided by the Eaſt-India companies of both nations; or, in caſe they could not agree, by the King of England and the States of Holland, according to an article in the treaty of 1619.—But before theſe diſputes could be decided in a legal way, the Dutch, in order to give the more ſpecious colouring to the violent ſeizure which they meditated of the iſland of Amboyna, made uſe of the ſtale pretext of a conſpiracy being formed by the Engliſh and Japaneſe to diſpoſſeſs them of one of their forts in this place. The plot, it was alleged, had been confeſſed by a Japaneſe and Portugueſe in the Engliſh ſervice, who were moſt inhumanly tortured till they ſhould anſwer in the affirmative ſuch interrogatories as might favour the ſecret deſign of thoſe cruel inquiſitors. Upon the injurious evidence of this conſtrained declaration, they immediately accuſed the Engliſh factors of the pretended conſpiracy. Some of them they impriſoned, and others they loaded with irons and ſent on board their ſhips; ſeizing at the ſame time all the Engliſh merchandiſe, with their writings and books.

Theſe acts of violence were followed by a ſcene of horror unexampled in the puniſhment of the moſt atrocious offenders. Some of the factors they tortured, by compelling them to ſwallow water till their bodies were diſtended to the utmoſt pitch; then taking the miſerable victims down from the boards to which they had been faſtened, and cauſing them to diſgorge the water; if they did not acknowledge the imputed guilt, the proceſs of torture was repeated. Others of the Engliſh they conſumed by burning them gradually from the feet upwards, in order to extort the confeſſion of a conſpiracy, which was only pretended by the infernal policy of thoſe ſavage tormenters. Some had the nails of the fingers and toes torn off; and in ſome they made holes in their breaſts, filling the cavities with inflammable materials, to which they afterwards put fire. Thoſe who did not expire under the agonies of torture were conſigned to the hands of the executioner.

The allegation of this pretended conſpiracy was equally void of probability and truth. The Dutch had a garriſon of 300 men in the fort, beſides the burghers in the town, and ſeveral other forts and garriſons in the iſland, while the number of the Engliſh did not amount to 20 men; nor were even thoſe provided with arms and ammunition to effect ſuch a deſign as that with which they were charged. There likewiſe was not one Engliſh veſſel in the harbour, whereas the Dutch had eight ſhips riding near the town: neither, when the Dutch broke open the deſks and trunks of the factors, was there found a ſingle paper or letter which could be conſtrued into the moſt diſtant relation to any conſpiracy. Add to all this, that ſuch of the unhappy ſufferers as could ſpeak to be heard, declared in the moſt ſolemn manner their innocence of the plot with which they were charged.

The whole of the tranſaction affords the moſt irrefragable teſtimony that it was founded entirely upon a political fiction of the Hollanders, who had themſelves formed the deſign of monopolizing the trade of the Spice Iſlands; for the accompliſhment of which they perpetrated, about the ſame time, a ſimilar tragedy at Pooleron, where they put to the torture 162 of the natives, whom they likewiſe charged with a pretended conſpiracy. It may juſtly be reckoned ſingular in the fortune of this commercial republic, that they have ever ſince been permitted to enjoy in peace thoſe invaluable iſlands, which were originally obtained by ſuch atrocious infringements of humanity and the laws of nations as will ſtain the Dutch annals, to the lateſt ages, with indelible infamy.

The more effectually to preſerve this trade, the Dutch have had all the clove-trees in the adjacent iſlands grubbed up. Sometimes alſo, when the harveſt is very large, part of the produce of Amboyna itſelf is burnt.—To prevent the rearing of cloves in any of the neighbouring iſlands, or the inhabitants from ſelling them to ſtrangers, the governor of Amboyna makes the tour of his government with a fleet of curricurries, conſiſting ſometimes of 20, and at others of 30, 40, or 50 ſail. This expedition is made with all the pomp imaginable, in order to gratify the pride and folly of the Indian chiefs. The true reaſon of their taking all this pains is, becauſe experience has ſhown, that no contracts, however ſolemn, can prevent the inhabitants of thoſe iſlands from ſelling their ſpice to ſtrangers; and even now, frauds are ſo frequently practiſed by the Dutch themſelves, though the company is inexorable in puniſhing them, that the common people call the cloves *galken-kruid*, that is, the gallows-ſpice.

Beſides the cloves, coffee is alſo cultivated here by the Dutch, and a gold mine has been lately found out. This was diſcovered by the quantities of gold-duſt that were waſhed from ſome mountains by the torrents. Here alſo grow ſeveral kinds of valuable wood, of which they make tables, chairs, eſcritoirs, &c. for the principal perſons in the government; and the reſt is ſold all over the Indies at a very extravagant rate.

Amboyna is divided into two parts, viz. a greater and leſſer peninſula. The former, called *Hitôn*, is 12 leagues in length, and two and a half broad. In this the Dutch have no leſs than five forts, or rather ſtrong redoubts, mounted with cannon. The other is called *Leytimor*, five leagues in length, and one and a half broad, which is the ſouthern part of the iſland; on this ſtands the fort of Victoria, which is the reſidence of the governor, and his council, compoſed of 15 gentlemen or merchants. The fortreſs is ſquare, the ramparts mounted with 60 pieces of braſs cannon, and the garriſon uſually compoſed of 600 men. It is ſo ſtrong by nature and art, as to be in a manner impregnable; and ſo effectually does it command the harbour, that no veſſel could come in or go out without being ſunk by the cannon, if the governor choſe. The inhabitants of Amboyna are computed at 70 or 80,000, of whom but a ſmall number are Dutch; and this obliges the latter to be continually upon their guard, and to keep a competent number of troops in each of their forts, particularly in that of Middleburgh, which ſtands upon the iſthmus that connects theſe peninſulas. There are alſo redoubts and garriſons in all the iſlands of this government.

AMBRACIA, one of the moſt conſiderable cities of ancient Epirus, ſituated on the river Aracthus, at a ſmall diſtance from the ſea. At firſt it was a free city; but was afterwards reduced by the Æacidæ kings of Epirus, who choſe it for the place of their reſidence. In proceſs of time the Ætolians made themſelves maſters of it, and held it till the year before Chriſt 189, when it fell into the hands of the Romans.

At this time Ambracia was a place of great ſtrength, It was defended on one ſide by the river Aracthus, and on the other by ſteep and craggy hills; and ſurrounded with an high and thick wall, above three miles in compaſs. The Roman conſul Fulvius began the ſiege by forming two camps, ſeparated by the river, but with a communication between them; the Romans were poſted in one, and the Epirots their allies in the other. He then threw up two lines, one of circumvallation, and the other of contravallation; and built a wooden tower, in the form of a caſtle over againſt the citadel, which ſtood on a hill. The Ætolians, however, before the lines were quite finiſhed, found means to throw about 1000 men into the place.

The lines being completed, the city was attacked in five different places at once. The battering-rams ſhook the walls on all ſides; and the Romans, from their moveable towers, pulled down the battlements with a kind of ſcythes which they faſtened to long beams. The beſieged made a vigorous defence. They were night and day on the walls, and indefatigable in preventing the effects of the rams and ſcythes. The ſtrokes of the former they deadened, by letting down beams, large ſtones, lumps of lead, &c. by means of pullies, upon them when they were in motion; the others they rendered uſeleſs, by pulling the beams to which they were faſtened into the city with hooks contrived for the purpoſe.

While Fulvius was carrying on the ſiege, Nicander, the Ætolian prætor found means to throw 500 men into the city, under the command of one Nicodamus, with whom Nicander agreed to attack the Roman camp in the night-time; not doubting, that, if the garriſon from within, and the army from without, fell upon them at the ſame time, they would be obliged to raiſe the ſiege. Nicodamus narrowly watched the time at which he was ordered to ſally; and, though Nicander did not appear, marched out at the head of the garriſon, armed with fire-brands and torches. The Roman centinels, ſurpriſed at this ſight, ran to wake the legionaries, and ſoon ſpread a general alarm all over the camp. The legionaries marched in ſmall bodies as they happened to meet, to repulſe the enemy, whom they engaged in three different places. Two parties of the garriſon were driven back: but the third, commanded by two Ætolian generals, made a great ſlaughter of the Romans; and, not finding themſelves ſeconded by Nicander, retired in good order into the city.

Though the beſieged were thus abandoned, and had no hopes of aſſiſtance, they continued to defend themſelves with incredible vigour and reſolution. The Romans had no ſooner made a breach in the wall, but it was repaired, and a new one built behind it. The conſul, therefore, altered his meaſures; and, inſtead of making breaches with the ram, began to undermine the wall, in hopes of throwing down great part of it at once, and entering the city before the beſieged could have time to build a new wall. The miners being covered, were not obſerved by the garriſon, till the great quantities of earth brought out of the mine gave the alarm. The Ætolians immediately began a countermine; and having dug a trench of the depth they ſuppoſed the mine to be, they carried it along the wall where they heard the ſtrokes of the pick-axes of the Romans. When the two mines met, a battle enſued, firſt with pick-axes and ſpades, and then with ſwords and ſpears: but this attack did not laſt long, each party making themſelves a kind of rampart with the looſe earth. The Ætolians, in order to drive their enemies quite out of the mine, invented a machine, which they brought to the place where the two mines met: this was an hollow veſſel with an iron bottom, bored through in many places, and armed with ſpikes at proper diſtances to prevent the enemy from approaching it: this veſſel they filled with feathers, which they ſet on fire, and with bellows driving the ſmoke on the beſiegers, obliged them to leave the mine half-ſuffocated. This interval the Ætolians made uſe of in repairing the foundations of the wall.

The vigorous reſiſtance made by the Ambracians, however, did not raiſe the courage of the nation in general, who were determined on a peace with Rome at all events. Fulvius, in the mean time, being deſirous of getting poſſeſſion of Ambracia before the concluſion of the peace, employed Amynander, king of the Athamanes, to perſuade the inhabitants to ſurrender. As Amynander had great intereſt in Ambracia, having long reſided there, he eaſily perſuaded them to capitulate on the following terms, viz. That the Ætolian garriſon ſhould have leave to march out of the city; that the inhabitants ſhould pay 500 talents, 200 down, and the reſt at ſix equal payments; and that they ſhould deliver to the conſul all the priſoners and deſerters that were in the city. The gates were then opened to Fulvius; and he was preſented with a crown of gold, together with many fine ſtatues and pictures, of which there were great numbers in the city, it having been the capital of Pyrrhus, who had enriched it with many valuable monuments.

From this time the city of Ambracia made no figure in hiſtory. It is ſcarce known at preſent where the city ſtood; but that called *Arba*, in upper Albania, ſeems beſt to agree with what is ſaid of the ancient ſituation of this city. The river Aracthus, on which Ambracia was ſituated, is now called, by the natives, *Spagmagmuriſi*.

AMBREADA, thus they call the falſe or factitious amber, which the Europeans uſe in their trade with the negroes on the coaſt of Africa, and particularly on the river Senegal. There are ſome large and red pieces of it, a thouſand of which making twenty ropes or ſtrings, weigh three pounds. There are others ſmall, and alſo red, which weigh but two pounds and a half.

AMBRESBERRY, a market-town in Wiltſhire, about ſix miles north of Saliſbury, and ſituated in W. Long. 1. 40. and N. Lat. 51. 20.

AMBRONES, a Gauliſh people who lived near the foot of the Alps, between Switzerland and Provence. They invaded the Roman territories in conjunction with the Cimbri and Teutones; but were defeated with great ſlaughter by Marius, about 101 years before Chriſt. Their women, who had ſtaid during the engagement in a kind of fortification made with their carts, on ſeeing their huſbands flying, and the Romans at their heels, armed themſelves with axes, and, gnaſhing with their teeth, fell with fury on the purſuers and the purſued. Their firſt rage being ſpent, they deſired to ſurrender themſelves, upon the ſingle condition, that their chaſtity ſhould not be violated; but this equitable requeſt being denied, they firſt killed their children, and then themſelves, not one remaining alive out of the whole multitude.

AMBROSE-ISLAND, a ſmall iſland laid down in ſome of the moſt approved charts, and particularly mentioned in Mr Robertſon's Elements of Navigation, as lying in S. Lat. 25. 30. W. Long. 82. 20. It was ſearched for, however, in 1767, by Captain Carteret, with ſuch diligence, that he concludes it to have no exiſtence, as he could not diſcover land any where near that place.

AMBROSE (St), biſhop of Milan, one of the moſt eminent fathers of the fourth century, born in Gaul in the year 333, according to Dr Cave, or in 340, as Mr Du Pin affirms. His father was at this time *præfectus Prætorio* in Gaul; and reſided at Arles, the capital of Gallia Narbonenſis. The birth of Ambroſe is ſaid to have been followed with a remarkable preſage of his future eloquence; for we are told, that a ſwarm of bees came and ſettled upon his mouth as he lay in his cradle. He ſoon made himſelf maſter of the ſeveral parts of ſecular learning; and pleaded cauſes before Probus with ſo much eloquence, that he was appointed his aſſeſſor, and ſoon after governor of the provinces of Liguria and Æmilia. He ſettled at Milan; where, in the year 374, upon the death of Auxentius biſhop of that city, there being a great conteſt between the Catholics and Arians concerning the choice of a new biſhop, Ambroſe thought it his duty, as governor, to go to the church, in order to compoſe the tumult. He accordingly addreſſed himſelf to the people in a gentle pathetic ſpeech, exhorting them to proceed in their choice in a calm and friendly manner: while he was ſpeaking to them, the whole aſſembly cried out with one voice, "Let Ambroſe be biſhop!" Such a ſudden and unexpected incident ſurpriſed him extremely; ſo that he retired immediately, and uſed every method to divert them from their reſolution of chooſing him: but at laſt he was obliged to comply; and was baptized (being but a catechumen before), and ordained biſhop, towards the latter end of the year 374, or beginning of 375. About the year 377, the barbarous nations making an incurſion into the Roman empire, he fled to Illyricum, and afterwards to Rome. In the year 384, he was ſent to the tyrant Maximus, who had uſurped the empire, and prevailed upon him not to paſs over into Italy. The heathens being encouraged by theſe inteſtine commotions in the empire, attempted to reſtore their religion, and employed Q. Aurelius Symmachus, prefect of Rome, a man of great eloquence, to plead their cauſe. This gave riſe to the famous conteſt between St Ambroſe and him, about repairing the altar of Victory. But Symmachus having loſt his cauſe, was expelled the city, and commanded not to approach within an hundred miles of it. The petition which he preſented to the emperor Valentinian the younger, is ſtill extant; we find in it the ſtrongeſt figures of rhetoric and the greateſt force of eloquence. St Ambroſe wrote a confutation of this petition; but he has been thought guilty of many paralogiſms: and yet he proteſts, "that he endeavoured only after the ſolidity of reaſoning, leaving Symmachus all the glory of eloquence and politeneſs; it being (ſays he) the peculiar privilege of the pagan philoſophers to amuſe the mind with colours as falſe as their idols; and to ſay great things, not being capable of ſaying true ones." Ambroſe met with a good deal of oppoſition from the Arians, againſt whom he acted with great ſpirit and intrepidity. Juſtina the empreſs and mother of Valentinian, who was an Arian, reſolving to reſtore Arianiſm at Milan, began with demanding of St Ambroſe one of the churches, which was called the Portian church; but he refuſed it; and the people ſurrounding the palace in a body, ſhe was obliged to leave him in poſſeſſion of his church, and even deſire him to pacify the people.

Ambroſe was a ſecond time ſent to the tyrant Maximus, for Valentinian found no perſon ſo proper to negotiate with him. He ſpoke to him with great courage and boldneſs, but could obtain nothing; for Maximus ſoon after marched into Italy, and made himſelf maſter of the weſtern empire: ſo that Valentinian was obliged to retire, with his mother Juſtina and his ſiſter Galla, to Theſſalonica in Illyricum, in order to deſire Theodoſius's aſſiſtance; who defeated Maximus, and reſtored Valentinian to the empire.

While Theodoſius continued in Italy, after the defeat of Maximus, an inſurrection happened at Theſſalonica, in which ſeveral of the magiſtrates were ſtoned, and their bodies dragged along the ſtreets. Theodoſius being informed of this, raſhly commanded a certain number of the inhabitants to be put to death promiſcuouſly;

cuouſly; by which means the city was filled with the blood of many innocent perſons, and amongſt the reſt ſeveral ſtrangers who were but juſt come there: no regard was had to any diſtinction of perſons, no form of trial was obſerved; but they were cut down like corn in the harveſt, as Theodoret expreſſes it, to the number of 7000. At this time an aſſembly of biſhops was held at Milan, who all expreſſed an abhorrence of ſuch cruelty in the emperor. Ambroſe wrote a letter to him, in which he repreſented the enormity of his crime, and exhorted him to make ſatisfaction by a ſincere ſubmiſſion and repentance. Some time after, Theodoſius coming to Milan, went to receive the ſacrament at the great church; where Ambroſe meeting him at the door, denied him entrance, and repreſented his guilt in the moſt forcible and pathetic terms. The emperor was ſtruck with his words, and with great uneaſineſs of mind returned to his palace; but about a year after, Ambroſe, being convinced of the ſincerity of his repentance, admitted him into the church.

In 392, Valentinian the emperor being aſſaſſinated by the contrivance of Argobaſtes, and Eugenius uſurping the empire, Ambroſe was obliged to leave Milan; but he returned the year following, when Eugenius was defeated. He died at Milan the fourth of April 797; being 57 years of age, according to Mr Du Pin and ſome other writers; but Dr Cave and Olearius ſay that he was 64 years old at his death. He was buried in the great church at Milan. He wrote ſeveral works, the moſt conſiderable of which is that *De officiis*. He is conciſe and ſententious in his manner of writing, and full of turns of wit; his terms are well choſen, and his expreſſions noble; he diverſifies his ſubject by an admirable copiouſneſs of thought and language; he is very ingenious in giving an eaſy and natural turn to every thing which he treats of, and is not without ſtrength and pathos when there is occaſion for it. This is part of the character which Du Pin gives him as a writer; but Eraſmus obſerves that he has many quaint and affected ſentences, and frequently very obſcure ones; and it is certain that his writings are intermixed with many ſtrange and peculiar opinions. Paulinus wrote his life, and dedicated it to St Auguſtin: this life is prefixed to St Ambroſe's works; the beſt edition of which is reckoned to be that publiſhed by the Benedictine monks, in two volumes in folio, at Paris, in 1686 and 1690.

AMBROSE (Iſaac), an eminent preſbyterian miniſter, was educated at Brazen-noſe college, Oxford, where he took the degree of bachelor of arts, and became miniſter of Preſton, and afterwards of Garſtan in Lancaſhire, where he was 1662 ejected for non-conformity. It was uſual with him to retire every year for a month into a little hut in a wood; where he ſhunned all ſociety, and devoted himſelf to religious contemplation. Dr Calamy obſerves, that he had a very ſtrong impulſe on his mind of the approach of death, and took a formal leave of his friends at their houſes a little before his departure; and the laſt night of his life he ſent his diſcourſe concerning *angels* to the preſs. The next day he ſhut himſelf up in his parlour, where, to the great ſurpriſe and regret of all who ſaw him, he was found juſt expiring. He died in 1663-4, in the 72d year of his age. He wrote ſeveral other books; as the *Prima, Media, et Ultima*, or the Firſt, Middle, and Laſt Things; War with devils; Looking unto Jeſus; &c.

AMBROSE, or St AMBROSE *in the Wood*, an order of religious, who uſe the Ambroſian office, and wear an image of that ſaint engraven on a little plate: in other reſpects, they conform to the rule of the Auguſtins. See AMBROSIAN *Office*, and AUGUSTINS.

AMBROSIA, in heathen antiquity, denotes the ſolid food of the gods, in contradiſtinction from the drink, which was called *nectar*. It had the appellation *ambroſia* (compounded of the particle α, and βροτος, *immortal*,) as being ſuppoſed to render thoſe immortal who fed on it.

AMBROSIA is alſo a ſplendid kind of title, given by ſome phyſicians to certain alexipharmic compoſitions, of extraordinary virtue. The name was particularly given to a famous antidote of Philip of Macedon, againſt all poiſons, bites, and ſtings of venomous creatures, as well as many internal diſeaſes.

AMBROSIA: A genus of the pentandria order, belonging to the monœcia claſs of plants; and, in the natural method, ranking under the 49th order, *Compoſitæ-nucamentaceæ*. The characters are:—The MALE flowers are compound: The common *calyx* is a ſingle-leav'd perianthium, the length of the florets: The compound *corolla* is uniform, tubular, flat, and hemiſpherical; the proper is monopetalous, funnel-ſhaped, and quinquefid: The *ſtamina* conſiſt of five very ſmall filaments; the antheræ are erect, parallel, and pointed: The *piſtillum* has a filiform ſtylus, the length of the ſtamina; the ſtigma orbicular and membranous: The *receptaculum* is naked.—FEMALE flowers below the male ones, on the ſame plant, doubled: The *calyx* is a ſingle-leav'd perianthium, entire (with the belly quiquedentated), one-flowered, and perſiſtent: There is no *corolla*: The *piſtillum* has an ovate germen in the bottom of the calyx; a filiform ſtylus, the length of the calyx; and two long briſtly ſtigmata: The *pericarpium* is an ovate unilocular nut: The *ſeed* is ſingle and roundiſh. Of this genus five ſpecies are enumerated; but having no properties worthy of notice, we omit any farther account of them.

AMBROSIAN OFFICE, or RITE, in church-hiſtory, a particular formula of worſhip in the church of Milan, which takes its name from St Ambroſe, who inſtituted that office in the fourth century. Each church originally had its particular office; and when the Pope, in aftertimes, took upon him to impoſe the Roman office upon all the weſtern churches, that of Milan ſheltered itſelf under the name and authority of St Ambroſe; from which time the Ambroſian ritual has prevailed.

AMBROSIN, in middle-age writers, denotes a coin ſtruck by the lords or dukes of Milan, whereon was repreſented St Ambroſe on horſeback, with a whip in his right hand. The occaſion of this coinage is ſaid to have been a viſion of that ſaint, who appeared to the Milaneſe general in 1339, during the time of a battle.

AMBROSINIA, in botany; a genus of the polyandria order, belonging to the gynandria claſs of plants; the characters of which are: The *calyx* is a ſingle-leaved ſpatha, divided by a partition into two cells: There is no *corolla*: The *ſtamina* conſiſt of a ſingle filament in the interior cell; the antheræ are numerous, with two roundiſh concave nectaries at their baſe; the *piſtillum* is in the interior cell; the germen roundiſh; the ſtylus cylindrical, and ſhorter than the ſpatha; the ſtigma obtuſe: The *pericarpium* a capſule;) roundiſh and unilocular. There is but one ſpecies, a native of Turkey.

AMBROSIUS AURELIANUS, or AURELIUS AMBROSIUS, a famous general of the ancient Britons, of Roman extraction. He was educated at the court of Aldroen of Amorica; who, at the requeſt of the Britons, ſent him over with ten thouſand men, to aſſiſt them againſt the Saxons, whom Vortigern had invited into Britain. Ambroſius had ſuch ſucceſs againſt the Saxons, that the Britons choſe him for their king, and compelled Vortigern to give up to him all the weſtern part of the kingdom divided by the Roman highway called *Watling-ſtreet*. Some time after, the Britons being diſcontented with Vortigern, and having withdrawn their allegiance from him, he retired to a caſtle in Wales, where being beſieged by Ambroſius, and the caſtle taking fire, he periſhed in the flames, and left his rival ſole monarch of Britain; who now took upon him the imperial purple, after the manner of the Roman emperors. Geoffrey of Monmouth tells us, that Ambroſius built Stonehenge near Saliſbury in Wiltſhire Ambroſius, according to this hiſtorian, coming to a monaſtery near Caercaradoc, now Saliſbury, where three hundred Britiſh lords, maſſacred by Hengiſt, lay buried, and reſolving to perpetuate the memory of this action, he ordered his workmen to prepare a large quantity of ſtones and other materials. But having, at the inſtigation of Tremonus, archbiſhop of Caerleon, conſulted the famous Merlin, this magician adviſed him to ſend over to Ireland for certain great ſtones, called *chorea gigantum*, the giant's dance, placed in a circle on a hill called *Killair*, having been brought thither by giants from the fartheſt borders of Africa. A body of forces were accordingly ſent into Ireland, under Pendragon, Ambroſius's brother, to fetch theſe ſtones; but were oppoſed in their attempt by Gilliomanus king of the country, who derided the folly of the Britons in undertaking ſo ridiculous an expedition. Nevertheleſs, the Britons having vanquiſhed this prince in battle, brought away the ſtones; and by the direction and aſſiſtance of Merlin, who had accompanied them, theſe wonderful ſtones, by order of Ambroſius, were placed over the graves of the Britiſh lords, and are now what is called *Stonehenge*. Alexander Mecham celebrates this fable in his poem *De divinæ ſapientiæ laudibus*. Polydore Virgil aſſigns another origin of Stonehenge; he tells us it was erected by the Britons as a monument to their general Ambroſius, on the place where he fell in battle, to perpetuate the memory of his glorious actions and ſervices done to his country. Both theſe ſtories are rejected by our beſt antiquaries; who, however, are by no means agreed as to the true origin of this famous piece of antiquity. See STONEHENGE.

After the Britons had defeated the Saxons, and obliged them to retire northward, Ambroſius is ſaid to have convened the princes and great men at York, where he gave orders for repairing the churches deſtroyed by the Saxons, and reſtoring the exerciſe of religion to its former luſtre. This is confirmed by Matthew of Weſtminſter; who highly applauds the great zeal of Ambroſius in repairing the churches, encouraging the clergy, and reſtoring the honour of religion. The Monmouth hiſtorian gives this prince a very high character. "He was a man (ſays he) of ſuch bravery and courage, that when he was in Gaul no one durſt enter the liſts with him; for he was ſure to unhorſe his antagoniſt, or to break his ſpear into ſhivers. He was, moreover, generous in beſtowing, careful in performing religious duties, moderate in all things, and more eſpecially abhorred a lie. He was ſtrong on foot, ſtronger on horſeback, and perfectly qualified to command an army." The ſame author tells us he was poiſoned at Wincheſter by one Eopa a Saxon, diſguiſed as a phyſician, and hired for that purpoſe by Paſcentius one of the ſons of Vortigern: but the generally received opinion is, that he was killed in a battle which he loſt in the year 508, againſt Cerdric, one of the Saxon generals.

AMBRY, a place in which are depoſited all the utenſils neceſſary for houſe-keeping. In the ancient abbeys and priories, there was an office under this denomination, wherein were laid up all charities for the poor.

AMBUBAJÆ, in Roman antiquity, were immodeſt women, who came from Syria to Rome, where they lived by proſtitution, and by playing on the flute. The word is derived from the Syriac *abub*, which ſignifies a flute; altho' others make it to come from *am* and *Baiæ*, becauſe theſe proſtitutes often retired to Baiæ. According to Cruquius, theſe women uſed likewiſe to ſell paint for ornamenting the face, &c.

AMBULANT, or AMBULATORY. They give in France the name of *ambulant commiſſioners* to thoſe commiſſioners, or clerks of the king's farms, who have no ſettled office; but viſit all the offices within a certain diſtrict, to ſee that nothing be done in them againſt the king's right and the intereſt of the farm.

AMBULANT is alſo uſed to denote thoſe brokers at Amſterdam, or exchange agents, who have not been ſworn before the magiſtrates. They tranſact brokerage buſineſs, but their teſtimony is not received in the courts of juſtice.

AMBULATORY, a term anciently applied to ſuch courts, &c. as were not fixed to any certain place; but held ſometimes in one place, and ſometimes in another. In oppoſition to ſtationary courts.—The court of parliament was anciently ambulatory; ſo alſo were the courts of king's bench, &c.

AMBURBIUM, in Roman antiquity, a proceſſion made by the Romans round the city and pomœrium, in which they led a victim, and afterwards ſacrificed it, in order to avert ſome calamity that threatened the city.

AMBURY, or ANBURY, among farriers, denotes a tumor, wart, or ſwelling, which is ſoft to the touch, and full of blood.

This diſorder of horſes is cured by tying a horſehair very hard about its root; and, when it has fallen off, which commonly happens in about eight days, ſtrewing ſome powder of verdigriſe upon the part, to prevent the return of the complaint. If the tumor be ſo low that nothing can be tied about it, they cut it out with a knife, or elſe burn it off with a ſharp hot iron; and, in ſinewy parts, where a hot iron is improper, they eat it away with oil of vitriol, or white ſublimate.

Many of our farriers boaſt of a ſecret which infallibly cures all kinds of protuberances of this kind; the preparation of which is this: Take three ounces of green vitriol and one ounce of white arſenic; beat them to a coarſe powder, and put them into a crucible; place the crucible in the midſt of a charcoal fire, ſtirring the ſubſtance, but carefully avoiding the poiſonous ſteams; when the whole grows reddiſh, take the crucible out of the fire, and, when cool, break it and take out the matter at the bottom; beat this to powder in a mortar, and add to four ounces of this powder five ounces of *album rhoſis;* make the whole into an ointment, and let it be applied cold to warts; rubbing them with it every day. They will by this means fall off gently and eaſily, without leaving any ſwellings. It is beſt to keep the horſe quiet, and without working, during the cure. What ſores remain on the parts which the ſwellings fall off from, may be cured with the common application called the *counteſs's ointment.*

AMBUSCADE, or AMBUSH, in the military art, properly denotes a place where ſoldiers may lie concealed till they find an opportunity to ſurpriſe the enemy.

In the language of Scripture theſe terms are not always taken in their proper ſignification, for laying ambuſhes for any one, attacking him in ſecret, laying ſnares for him. They ſometimes ſignify no more than attacking a man who has no diſtruſt of ſuch a thing; attacking one behind, concealing one's ſelf in ſome particular place in order to ſurpriſe any one. See the book of Judges, ch. ix. 25, 32, 34, 35. Abimelech, who lay lurking with his people in the heights of Sichem, ſo, however, as to rob and treat thoſe who paſſed that way very ill, came and attacked the city of Sichem with his troops divided into three bodies: *Tetendit inſidias juxta Sichimam in quatuor locis.* Literally, according to the Hebrew, "They prepared ambuſcades againſt Sichem in four heads or companies." And a little farther, ver. 43. "Abimelech being informed that the Sichemites were marched, took his army and divided it into three bodies, and laid wait for them in the field." It ſeems certain, that in theſe paſſages, ambuſhes, properly ſo called, were not the things in queſtion. In the firſt book of Samuel, Saul complains that David laid ambuſcades for him: *Inſidiator uſque hodie permanens.* Now nothing could be worſe grounded than this accuſation, if we underſtand the word *inſidiari* in its proper ſignification; but he might ſay, though unjuſtly, that David was his ſecret enemy. And in the Chronicles it is ſaid, that God turned the ambuſhes laid by the enemies of Iſrael upon themſelves; that is to ſay, their endeavours, their malice, their arms, he turned againſt themſelves: for the enemies there mentioned came not in private or by ſtratagem; they marched openly in arms againſt Iſrael.

AMBY, a town of the Auſtrian Netherlands, in the province of Limburgh, ſituated oppoſite Maeſtricht, on the eaſt ſide of the river Maeſe, in E. Long. 5. 45. N. Lat. 50. 57.

AMEDIANS, in church-hiſtory, a congregation of religious in Italy, ſo called from their profeſſing themſelves *amantes Deum,* "lovers of God;" or rather *amati Deo,* "beloved of God." They wore a grey habit and wooden ſhoes, had no breeches, and girt themſelves with a cord. They had 28 convents; and were united by Pope Pius V. partly with the Ciſtercian order, and partly with that of the Soccolanti, or wooden-ſhoe wearers.

AMELIA, an epiſcopal city of Italy, in the ſtate of the church, ſeated on a mountain, 50 miles N. E. of Rome, and 25 miles S. W. of Spoletto. E. Long. 13. 20. N. Lat. 42. 33.

AMELLUS, STARWORT: a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſitæ-oppoſitifoliæ.* The characters are: The common *calyx* is imbricated and roundiſh: The *compound corolla* is radiated; the hermaphrodite corollets numerous in the diſk; the female numerous in the ray: *Proper* corolla of the hermaphrodites are tubular and quinquefid; of the females, tongued, looſe, and two or three toothed: The *ſtamina* in the hermaphrodites conſiſt of five ſhort capillary filaments; the antheræ cylindric and tubular: The *piſtillum* has an ovate germen; a filiform ſtylus the length of the ſtamina; and two filiform ſtigmata: There is no *pericarpium,* but the calyx unchanged: The *ſeeds* are ovate and ſolitary: the *pappus* is hairy; the *receptaculum* chaffy.—Of this there are two

Species. 1. The lynchitis, with one flower on each footſtalk. This is a native of the Cape of Good Hope. It is a perennial plant, riſing about three feet high, ſending out many branches on each ſide, ſo as to form a buſhy plant; the branches are garniſhed with obtuſe ſpear-ſhaped leaves placed oppoſite, and are terminated by ſingle naked flower ſtalks, each ſupporting one violet-coloured flower, having a yellow diſk, which is ſucceeded by oblong ſeeds. 2. The umbellatus, with flowers growing in umbels, is a native of Jamaica; and riſes from two to three feet high, ſending out many branches cloathed with oppoſite leaves, which are terminated by ſmall flowers in umbels.

Culture. The firſt is eaſily propagated, either by cuttings planted in the ſummer months, or by ſeeds ſown on a moderate hot-bed in the ſpring, but the plants require a ſlight ſhelter in winter. The ſecond is much more tender, and therefore requires to be preſerved in a ſtove during the winter ſeaſon.

AMELOT DE LA HOUSAI (Nicholas), born at Orleans in 1634, was much eſteemed at the court of France, and appointed ſecretary of an embaſſy which that court ſent to the commonwealth of Venice, as appears by the title of his tranſlation of Father Paul's Hiſtory of the Council of Trent; but he afterwards publiſhed writings which gave ſuch offence, that he was impriſoned in the Baſtile. The firſt works he printed were the Hiſtory of the Government of Venice, and that of the Uſcocks, a people of Croatia. In 1683 he publiſhed his tranſlations in French of Machiavel's Prince, and Father Paul's Hiſtory of the Council of Trent, and Political Diſcourſes of his own upon Tacitus. Theſe performances were well received by the public. He did not prefix his own name to the two laſt mentioned works, but concealed himſelf under that of La Mothe Joſſeval. His tranſlation of Father Paul was attacked by the partiſans of the pope's unbounded power and authority. In France, however, it met with great ſucceſs: all the advocates for the liberty of the Gallican church promoting the ſucceſs of it to the utmoſt of their power, though at the ſame time there were three memorials preſented to have it ſuppreſſed. When the ſecond edition of this tranſlation was publiſhed, it was violently attacked by the Abbè St Real, in a letter he wrote to Mr Bayle, dated October 17, 1685. Amelot defended himſelf, in a letter to the ſame gentleman. In 1684, he printed at Paris a French tranſlation of Baltaſar Gracian's *Oraculo manual*, with the title of *l'Homme de Cour*. In 1686, he printed *La Morale de Tacite de la flaterie;* in which work he collected ſeveral particular facts and maxims, which repreſent in a ſtrong light the artifices of court-flatterers, and the miſchievous effect of their poiſonous diſcourſes. Frederick Leonard, a bookſeller at Paris, having propoſed, in the year 1692, to print a collection of all the treaties of peace between the kings of France, and all the other princes of Europe, ſince the reign of Charles VII. to the year 1690, Amelot publiſhed a ſmall volume in duodecimo, containing a preliminary diſcourſe upon theſe treaties; wherein he endeavours to ſhow, that moſt princes, when they enter into a treaty, think more how to evade than how to perform the terms they ſubſcribe to. He publiſhed alſo an edition of Cardinal d'Oſſat's Letters, in 1697, with ſeveral obſervations of his own; which, as he tells us in his advertiſement, may ſerve as a ſupplement to the hiſtory of the reigns of Henry III. and Henry IV. kings of France. He wrote ſeveral other works; and died at Paris in 1706, being then almoſt 73 years of age.

AMELOT (Denis), a celebrated French writer, was born at Saintonge in 1606. He maintained a cloſe correſpondence with the fathers of the Oratory, a congregation of prieſts founded by Philip of Neri. He wrote the life of Charles de Gondren, ſecond ſuperior of this congregation, and publiſhed it at Paris in 1643. In this piece he ſaid ſomething of the famous Abbot of St Cyran, which greatly diſpleaſed the gentlemen of Port Royal; who, to be revenged of him, publiſhed a libel againſt him, intitled, *Idée generale l'eſprit et de livre de P. Amelote.* He was ſo much provoked by this ſatire, that he did all in his power to injure them. They had finiſhed a tranſlation of the New Teſtament, and were deſirous to have it publiſhed; for which purpoſe they endeavoured to procure an approbation from the doctors of the Sorbonne, and a privilege from the king. But Amelot, by his influence with the Chancellor, prevented them from ſucceeding. In this he had alſo a view to his own intereſt; for he was about to publiſh a tranſlation of his own of the New Teſtament. Amelot's tranſlation with annotations, in 4 vols. octavo, was printed in the years 1666, 1667, and 1668. It is not very exact, according to F. Simon, who tells us that it contains ſome very groſs blunders. Amelot wrote alſo an Abridgment of Divinity, a Catechiſm for the Jubilee, and a kind of Chriſtian Manual for every Day. Towards the end of his life, he entered into the congregation of the Oratory in 1650; and continued amongſt them till his death, which happened in 1678.

AMEN, אמן, ſignifies *true*, *faithful*, *certain*. It is made uſe of likewiſe to affirm any thing, and was a ſort of affirmation uſed often by our Saviour: Αμην, Αμην, λεγω υμιν; i. e. *Verily, Verily, I ſay unto you.* Laſtly, it is underſtood as expreſſing a wiſh; as *Amen, So be it*, Numb. v. 22. or an affirmation, *Amen, yes, I believe it*, 1 Cor. xiv. 16. The Hebrews end the five books of Pſalms, according to their way of diſtributing them, with the words *amen, amen;* which the Septuagint have tranſlated γενοιτο, γενοιτο; and the Latins *fiat, fiat*. The Greek and Latin churches have preſerved this word in their prayers, as well as *alleluiah* and *hoſanna;* becauſe they obſerved more energy in them than in any terms which they could uſe in their own languages. At the concluſion of the public prayers, the people anſwered with a loud voice, Amen; and St Jerom ſays, that at Rome when the people anſwered Amen, the ſound of their voices was like a clap of thunder: *In ſimilitudinem cæleſtis tonitrui Amen reboat.* The Jews aſſert that the gates of heaven are opened to him who anſwers *Amen* with all his might.

AMEND, or AMENDE, in the French cuſtoms, a pecuniary puniſhment impoſed by a judge for any crime, falſe proſecution, or groundleſs appeal.

AMENDE Honourable, an infamous kind of puniſhment, inflicted in France upon traitors, parricides, or ſacrilegious perſons, in the following manner: The offender being delivered into the hands of the hangman, his ſhirt is ſtripped off, a rope put about his neck, and a taper in his hand; then he is led into court, where he muſt beg pardon of God, the king, the court, and his country. Sometimes the puniſhment ends here; but ſometimes it is only a prelude to death, or baniſhment to the galleys.

AMENDE Honourable, is a term alſo uſed for making recantation in open court, or in preſence of the perſon injured.

AMENDMENT, in a general ſenſe, denotes ſome alteration or change made in a thing for the better.

AMENDMENT, in law, the correction of an error committed in the proceſs, which may be amended after judgment, unleſs the error lies in giving judgment; for in that caſe it is not amendable, but the party muſt bring a writ of error. A bill may be amended on the file at any time before the plea is pleaded; but not afterwards, without motion and leave of the court.

AMENDMENT of a Bill, is ſome alteration made in the firſt draught of it.

AMENTUM, in botany, the name of a ſpecies of calyx, conſiſting of valves, and hanging down, in different directions, from the caulis. Common oats afford a good example of the amentum.

AMENTUM, in Roman antiquity, a thong tied about the middle of a javelin, or dart, and faſtened to the forefinger, in order to recover the weapon as ſoon as it was diſcharged. The ancients made great uſe of the amentum, thinking it helped to enforce the blow. It alſo denotes a latchet that bound their ſandals.

AMERADE, a kind of officers among the Saracens, anſwering to the governors of provinces among the Europeans.—The name is originally the ſame with that of emir.

AMERCEMENT, or AMERCIAMENT, in law, a pecuniary puniſhment impoſed on offenders at the mercy of the court. It differs from a fine in being impoſed arbitrarily in proportion to the fault; whereas a fine is a certain puniſhment ſettled expreſsly by ſome ſtatute.

AMERICA; one of the four quarters of the world, probably the largeſt of the whole, and, from its late diſcovery, frequently denominated the *New-World*, or *New-Hemiſphere*.

1 Boundaries

This vaſt country extends from the 80th degree of north, to the 56th degree of ſouth, latitude; and, where its breadth is known, from the 35th to the 136th degree weſt longitude from London; ſtretching between 8000 and 9000 miles miles in length, and in its greateſt breadth 3690. It ſees both hemiſpheres, has two ſummers and a double winter, and enjoys almoſt all the variety of climates which the earth affords. It is waſhed by the two great oceans. To the eaſtward, it has the Atlantic, which divides it from Europe and Africa; to the weſt, it has the Pacific or Great South-Sea, by which it is ſeparated from Aſia. By theſe ſeas it may, and does, carry on a direct commerce with the other three parts of the world.

2 North and South continent.

America is not of equal breadth throughout its whole extent; but is divided into two great continents, called *North*, and *South*, *America*, by an iſthmus 1500 miles long, and which, at Darien, about Lat. 9° N. is only 60 miles over. This iſthmus forms, with the northern and ſouthern continents, a vaſt gulph, in which lie a great number of iſlands, called the *Weſt-Indies*, in contradiſtinction to the eaſtern parts of Aſia, which are called the *Eaſt-Indies*.

3 Grand objects which America preſents to view.

"Next to the extent of the New-World, the grandeur of the objects which it preſents to view, is moſt apt to ſtrike the eye of an obſerver. Nature ſeems here to have carried on her operations upon a larger ſcale and with a bolder hand, and to have diſtinguiſhed the features of this country by a peculiar magnificence. The mountains of America are much ſuperior in height to thoſe in the other diviſions of the globe. Even the plain of Quito, which may be conſidered as the baſe of the Andes, is elevated farther above the ſea than the top of the Pyrenees." The moſt elevated point of the Andes, according to Don Ulloa, is twenty thouſand, two hundred, and eighty feet, which is, at leaſt, ſeven thouſand, one hundred, and two feet above the Peak of Teneriffe, which is the higheſt known mountain in the ancient continent. (See the article ANDES.)

4 Its mountains.

5 Its rivers.

From the lofty and extenſive mountains of America deſcend rivers with which the ſtreams of Europe, of Aſia, or of Africa, are not to be compared, either for length of courſe, or for the vaſt volumes of water which they pour into the oceans. The Danube, the Indus, the Ganges, or the Nile, in the Ancient Hemiſphere, are not of equal magnitude with the St. Laurence, the Miſſouri, or the Miſſiſſippi, in North-America; or with the Maragnon, the Orinoco, or the Plata, in South-America. The rivers in the latter of theſe American continents are like vaſt arms of the ſea. (See the articles ST. LAURENCE, MISSOURI, &c. &c.)

6 Its lakes.

"The lakes of the New-World are no leſs conſpicuous for grandeur than its mountains and rivers. There is nothing in other parts of the globe which reſembles the prodigious chain of lakes in North-America. They may be properly termed inland ſeas of freſh water; and even thoſe of the ſecond or third claſs of magnitude, are of larger circuit (the Caſpian ſea excepted) than the greateſt lake of the ancient continent." (See the articles SUPERIOR, HURON, ERIE, &c.)

The luxuriance of the vegetable creation in the New-World is extremely great. In the ſouthern provinces, where the moiſture of the climate is aided by the warmth of the ſun, the woods are almoſt impervious, and the ſurface of the ground is hid from the eye, under a thick covering of ſhrubs, of herbs, and weeds. In the northern provinces, although the foreſts are not encumbered with the ſame wild luxuriance of vegetation, the trees of various ſpecies are generally more lofty, and often much larger, than are to be ſeen in any other parts of the world.

7 Its exceſſive luxuriance of vegetation.

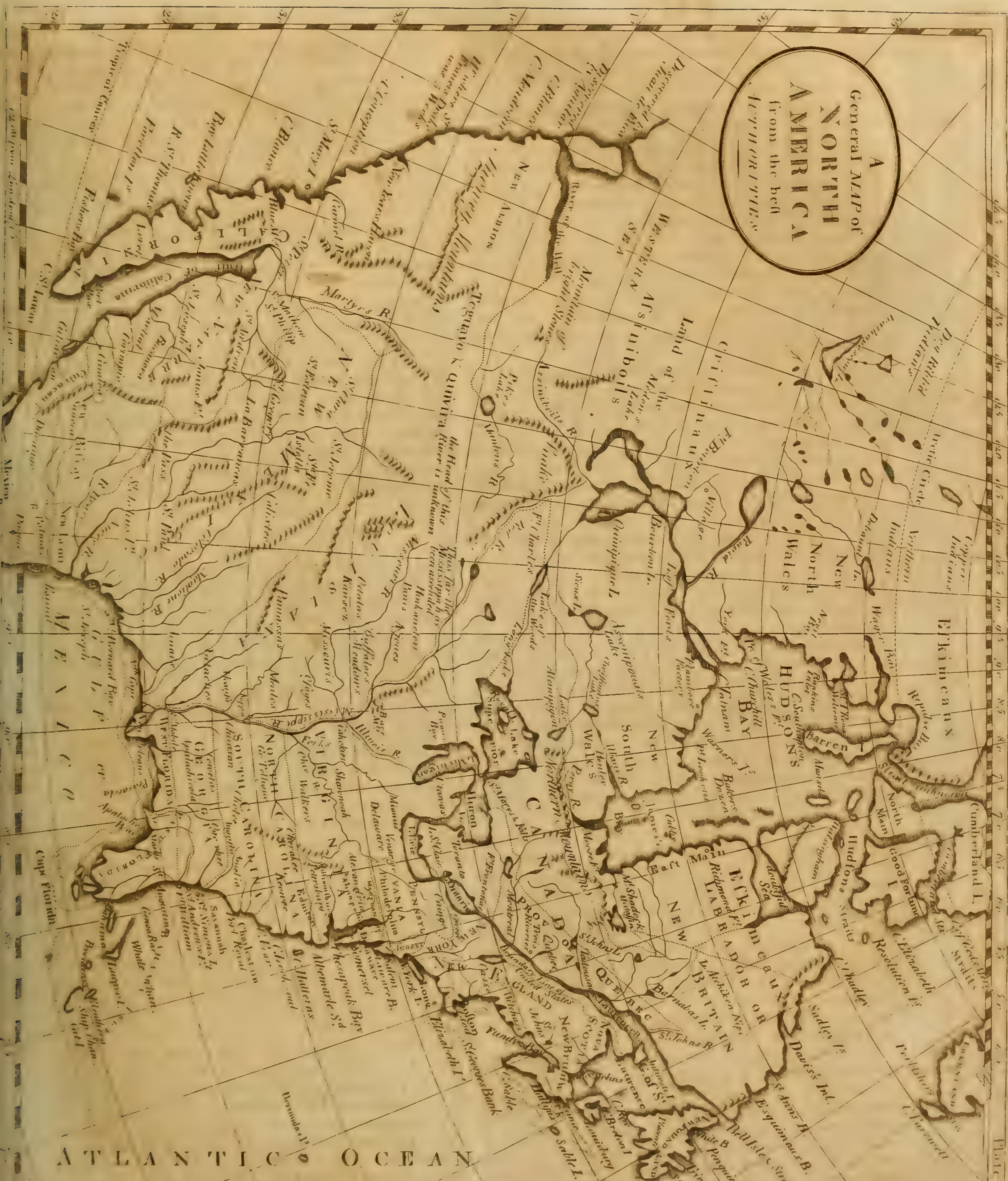
8 Remarkable prevalence of cold in America.

One of the moſt remarkable circumſtances, or features, of the New-World, is the general predominance of cold, throughout the whole extent of this great continent. Though we cannot, in any country, determine the preciſe degree of heat merely by the diſtance of the equator, becauſe the elevation above the ſea, the nature of the ſoil, &c. all affect the climate; yet, in the Ancient Continent, the heat is much more in proportion to the vicinity to the equator than in any part of America. Here the rigour of the frigid zone extends over half that which ſhould be temperate by its poſition. Even in thoſe latitudes where the winter is ſcarcely felt in the Old-Continent, it reigns with great ſeverity in America, though during a ſhort period. Nor does this cold, prevalent in the New-World, confine itſelf to the temperate zones; but extends its influence to the torrid zone alſo, conſiderably mitigating the exceſs of its heat.—Along the eaſtern coaſt, the climate, tho' more ſimilar to that of the torrid zone in other parts of the earth, is nevertheleſs conſiderably milder than in thoſe countries of Aſia and Africa which lie in the ſame latitude. From the ſouthern tropic to the extremity of the American continent, the cold is ſaid to be much greater than in parallel northern latitudes even of America itſelf.

9 Dr Robertſon's reaſons for this ſuperior degree of cold, *Hiſtory of America*, vol.II.p.10, 11, 12, & 13.

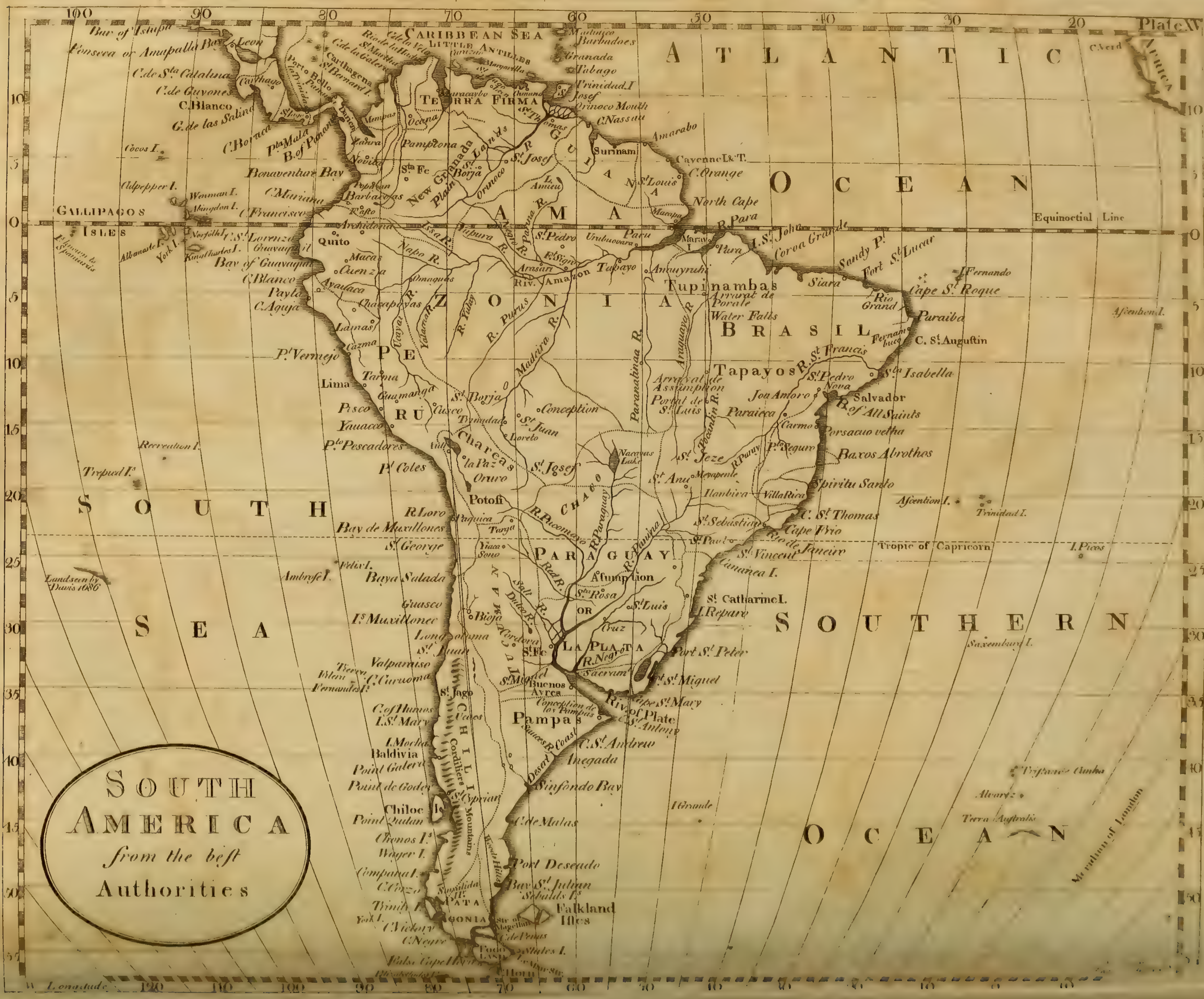
For this ſo remarkable difference between the climate of the New-Continent and the Old, various cauſes have been aſſigned by different authors. The following is the opinion of the celebrated Dr Robertſon on this ſubject. "Though the utmoſt extent of America towards the north be not yet diſcovered, we know that it advances nearer to the pole than either Europe or Aſia. The latter have large ſeas to the north, which are open during part of the year; and even when covered with ice, the wind that blows over them is leſs intenſely cold than that which blows over land in the ſame latitudes. But, in America, the land ſtretches from the river St Laurence towards the pole, and ſpreads out immenſely to the weſt. A chain of enormous mountains, covered with ſnow and ice, runs through all this dreary region. The wind paſſing over ſuch an extent of high and frozen land, becomes ſo impregnated with cold, that it acquires a piercing keeneſs, which it retains in its progreſs through warmer climates; and is not entirely mitigated until it reach the gulph of Mexico. Over all the continent of North-America, a north-weſterly wind and exceſſive cold are ſynonimous terms. Even in the moſt ſultry weather, the moment that the wind veers to that quarter, its penetrating influence is felt in a tranſition from heat to cold no leſs violent than ſudden. To this powerful cauſe we may aſcribe the extraordinary dominion of cold, and its violent inroads into the ſouthern provinces in that part of the globe.

"Other cauſes, no leſs remarkable, diminiſh the active



A General MAP of NORTH AMERICA from the beſt AUTHORITIES
Plate VII
ATLANTIC OCEAN
WESTERN SEA
Land of the Aſsiniboils
Criſtinaux
Eſkimeaux
New North Wales
New South Wales
HUDSONS BAY
LABRADOR OR NEW BRITAIN
CANADA
QUEBEC
NEW ENGLAND
NEW YORK
PENSYLVANIA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
FLORIDA
LOUISIANA
NEW MEXICO
CALIFORNIA
Gulf of California
Quivira
Teguayo
Miſsiſsippi R.
Miſsouri R.
Lake Superior
Lake Huron
Lake Erie
Lake Ontario
Lake Michigan
Hudsons Straits
Davis's Inl.
Cumberland I.
Barren I.
Reſolution I.
Newfoundland
Bermuda I.
Cape Florida
Mexico
Tropic of Cancer
Arctic Circle

Plate VI



SOUTH AMERICA
from the best
Authorities

tive power of heat in thoſe parts of the American continent which lie between the tropics. In all that portion of the globe, the wind blows in an invariable direction from eaſt to weſt. As this wind holds its courſe acroſs the ancient continent, it arrives at the countries which ſtretch along the weſtern ſhore of Africa, inflamed with all the fiery particles which it hath collected from the ſultry plains of Aſia, and the burning ſands in the African deſarts. The coaſt of Africa is, accordingly, the region of the earth which feels the moſt fervent heat, and is expoſed to the unmitigated ardour of the torrid zone. But this ſame wind, which brings ſuch an acceſſion of warmth to the countries lying between the river of Senegal and Cafraria, traverſes the Atlantic-Ocean, before it reaches the American ſhore. It is cooled in its paſſage over this vaſt body of water; and is felt as a refreſhing gale along the coaſts of Braſil and Guiana, rendering theſe countries, though among the warmeſt in America, temperate, when compared with thoſe which lie oppoſite to them in Africa. As this wind advances in its courſe acroſs America, it meets with immenſe plains, covered with impenetrable foreſts; or occupied by large rivers, marſhes, and ſtagnating waters, where it can recover no conſiderable degree of heat. At length it arrives at the Andes, which run from north to ſouth through the whole continent. In paſſing over their elevated and frozen ſummits, it is ſo thoroughly cooled, that the greater part of the countries beyond them hardly feel the ardour to which they ſeem expoſed by their ſituation. In the other provinces of America, from Tierra-Fermè weſtward to the Mexican empire, the heat of the climate is tempered, in ſome places, by the elevation of the land above the ſea; in others, by their extraordinary humidity; and in all, by the enormous mountains ſcattered over this tract. The iſlands of America in the Torrid Zone are either ſmall or mountainous, and are fanned alternately by refreſhing ſea and land breezes.

"The cauſes of the extraordinary cold towards the ſouthern limits of America, and in the ſeas beyond it, cannot be aſcertained in a manner equally ſatisfying. It was long ſuppoſed, that a vaſt continent, diſtinguiſhed by the name of *Terra Auſtralis Incognita*, lay between the ſouthern extremity of America and the Antarctic pole. The ſame principles which account for the extraordinary degree of cold in the northern regions of America, were employed in order to explain that which is felt at Cape-Horn and the adjacent countries. The immenſe extent of the ſouthern continent, and the large rivers which it poured into the ocean, were mentioned and admitted by philoſophers as cauſes ſufficient to occaſion the unuſual ſenſation of cold, and the ſtill more uncommon appearances of frozen ſeas in that region of the globe. But the imaginary continent to which ſuch influence was aſcribed having been ſearched for in vain, and the ſpace which it was ſuppoſed to occupy having been found to be an open ſea; new conjectures muſt be formed with reſpect to the cauſes of a temperature of climate, ſo extremely different from that which we experience in countries removed at the ſame diſtance from the oppoſite pole.

Ib. I. p. 424, 425, note VI.

"The moſt obvious and probable cauſe of the ſuperior degre of cold towards the ſouthern extremity of America, ſeems to be the form of the continent there. Its breadth gradually decreaſes as it ſtretches from St Antonia ſouthwards, and from the bay of St Julian to the ſtraits of Magellan its dimenſions are much contracted. On the eaſt and weſt ſides, it is waſhed by the Atlantic and Pacific Oceans. From its ſouthern point, it is probable that a great extent of ſea, without any conſiderable tract of land, reaches to the Antarctic pole. In whichever of theſe directions the wind blows, it is cooled before it approaches the Magellanic regions, by paſſing over a vaſt body of water; nor is the land there of ſuch extent, that it can recover any conſiderable degree of heat in its progreſs over it. Theſe circumſtances concur in rendering the temperature of the air in this diſtrict of America, more ſimilar to that of an inſular, than to that of a continental climate; and hinder it from acquiring the ſame degree of ſummer-heat, with places in Europe and Aſia, in a correſponding northern latitude. The north wind is the only one that reaches this part of America, after blowing over a great continent. But, from an attentive ſurvey of its poſition, this will be found to have a tendency rather to diminiſh than augment the degree of heat. The ſouthern extremity of America is properly the termination of the immenſe ridge of the Andes, which ſtretches nearly in a direct line from north to ſouth, through the whole extent of the continent. The moſt ſultry regions in South-America, Guiana, Braſil, Paraguay, and Tucuman, lie many degrees to the eaſt of the Magellanic regions. The level country of Peru, which enjoys the tropical heats, is ſituated conſiderably to the weſt of them. The north wind, then, though it blows over land, does not bring to the ſouthern extremity of America an increaſe of heat collected in its paſſage over torrid regions; but, before it arrives there, it muſt have ſwept along the ſummits of the Andes, and comes impregnated with the cold of that frozen region."

10
Extreme moiſture of the American climate.

Another peculiarity in the climate of America is its exceſſive moiſture in general. In ſome places, indeed, on the weſtern coaſt, rain is not known; but, in all other parts, the moiſtneſs of the climate is as remarkable as the cold.—The foreſts wherewith it is every where covered, no doubt, partly, occaſion the moiſture of its climate; but the moſt prevalent and obvious cauſe is the vaſt quantity of water in the Atlantic and Pacific Oceans, with which America is environed on all ſides. Hence, thoſe places where the continent is narroweſt are deluged with almoſt perpetual rains, accompanied with violent thunder and lightning, by which ſome of them, particularly Porto-Bello, are rendered in a manner uninhabitable.

11
Malignity of climate unjuſtly aſcribed to America

From the coldneſs and the moiſture of America, an extreme malignity of climate has been inferred, and aſſerted by M. de Pauw, in his *Recherches Philoſophiques ſur les Americains*. Hence, according to the hypotheſis of this author, the ſmallneſs and irregularity of the nobler animals, and the ſize and enormous multiplication of reptiles and inſects.

Hiſtory of Mexico, vol. II. p. 255.

But the ſuppoſed ſmallneſs and leſs ferocity of the American animals, the Abbé Clavigero obſerves, inſtead of the malignity, demonſtrates the mildneſs and bounty of the clime, if we give credit to Buffon, at whoſe fountain M. de Pauw has drank, and of whoſe teſtimony he has availed himſelf againſt Don Pernetty. Buffon, who, in many places of his Natural Hiſtory produces the ſmallneſs of the American animals as a certain argument of the malignity of the climate of America; in treating afterwards of ſavage animals, in Tom. II. ſpeaks thus: " As all things, even the moſt free creatures, are ſubject to natural laws, and animals as well as men are ſubjected to the influence of climate and ſoil, it appears that the ſame cauſes which have civilized and poliſhed the human ſpecies in our climates, may have, likewiſe, produced ſimilar effects upon other ſpecies. The wolf, which is, perhaps, the fierceſt of all the quadrupeds of the temperate zone, is, however, incomparably leſs terrible than the tyger, the lion, and the panther of the torrid zone; and the white bear and hyena of the frigid zone. In America, where the air and the earth are more mild than thoſe of Africa, the tyger, the lion, and the panther, are not terrible but in the name. They have degenerated, if fierceneſs, joined to cruelty, made their nature; or, to ſpeak more properly, they have only ſuffered the influence of the climate: under a milder ſky their nature alſo has become more mild. From climes which are immoderate in their temperature are obtained drugs, perfumes, poiſons, and all thoſe plants whoſe qualities are ſtrong. The temperate earth, on the contrary, produces only things which are temperate; the mildeſt herbs, the moſt wholeſome pulſe, the ſweeteſt fruits, the moſt quiet animals, and the moſt humane men, are the natives of this happy clime. As the earth makes the plants, the earth and plants make animals; the earth, the plants, and the animals make man. The phyſical qualities of man, and the animals which feed on other animals, depend, though more remotely, on the ſame cauſes which influence their diſpoſitions and cuſtoms. This is the greateſt proof and demonſtration, that in temperate climes every thing becomes temperate, and that in intemperate climes every thing is exceſſive; and that ſize and form, which appear fixed and determinate qualities, depend notwithſtanding, like the relative qualities, on the influence of climate. The ſize of our quadrupeds cannot be compared with that of an elephant, the rhinoceros, or ſea-horſe. The largeſt of our birds are but ſmall if compared with the oſtrich, the condore, and *caſoare*." So far M. Buffon, whoſe text we have copied, becauſe it is contrary to what M. de Pauw writes againſt the climate of America, and to Buffon himſelf, in many other places.

" If the large and fierce animals, ſays Clavigero, are natives of intemperate climes, and ſmall and tranquil animals of temperate climes, as M. Buffon has here eſtabliſhed; if mildneſs of climate influences the diſpoſition and cuſtoms of animals, M. de Pauw does not well deduce the malignity of the climate of America from the ſmaller ſize and leſs fierceneſs of its animals; he ought rather to have deduced the gentleneſs and ſweetneſs of its climate from this antecedent. If, on the contrary, the ſmaller ſize and leſs fierceneſs of the American animals, with reſpect to thoſe of the old continent, are a proof of their degeneracy, ariſing from the malignity of the clime, as M. de Pauw would have it, we ought in like manner to argue the malignity of the climate of Europe from the ſmaller ſize and leſs fierceneſs of its animals, compared with thoſe of Africa. If a philoſopher of the country of Guinea ſhould undertake a work in imitation of M. de Pauw, with this title, *Recherches Philoſophiques ſur les Europeens*, he might avail himſelf of the ſame argument which M. de Pauw uſes, to demonſtrate the malignity of the climate of Europe, and the advantages of that of Africa. The climate of Europe, he would ſay, is very unfavourable to the production of quadrupeds, which are found incomparably ſmaller, and more cowardly than ours. What are the horſe and the ox, the largeſt of its animals, compared with our elephants, our rhinoceroſes, our ſea-horſes, and our camels? What are its lizards, either in ſize or intrepidity, compared with our crocodiles? Its wolves, its bears, the moſt dreadful of its wild beaſts, when beſide our lions and tygers? Its eagles, its vultures, and cranes, if compared with our oſtriches, appear only like hens."

12 America not more infeſted than many other countries with inſects and noxious animals.

As to the enormous ſize and prodigious multiplication of the inſects and other little noxious animals, " The ſurface of the earth (ſays M. de Pauw), infected by putrefaction, was over-run with lizards, ſerpents, reptiles, and inſects monſtrous for ſize, and the activity of their poiſon, which they drew from the copious juices of this uncultivated ſoil, that was corrupted and abandoned to itſelf, where the nutritive juice became ſharp, like the milk in the breaſt of animals which do not exerciſe the virtue of propagation. Caterpillars, crabs, butterflies, beetles, ſpiders, frogs, and toads, were, for the moſt part, of an enormous corpulence in their ſpecies, and multiplied beyond what can be imagined. Panama is infeſted with ſerpents, Carthagena with clouds of enormous bats, Porto-Bello with toads, Surinam with *kakerlacas*, or *cucarachas*, Guadaloupe, and the other colonies of the iſlands, with beetles, Quito with niguas, or chegoes, and Lima with lice and bugs. The ancient kings of Mexico, and the emperors of Peru, found no other means of ridding their ſubjects of thoſe inſects which fed upon them, than the impoſition of an annual tribute of a certain quantity of lice. Ferdinand Cortes found bags full of them in the palace of Montezuma." But this argument, exaggerated as it is, proves nothing againſt the climate of America, in general, much leſs againſt that of Mexico. There being ſome lands in America, in which, on account of their heat, their humidity, or want of inhabitants, large inſects are found, and exceſſively multiplied, will prove at moſt, that in ſome places the ſurface of the earth is infected, as he ſays, with putrefaction; but not that the ſoil of Mexico, or that of all America, is ſtinking, uncultivated, vitiated, and abandoned to itſelf. If ſuch a deduction were juſt, M. de Pauw might alſo ſay, that the ſoil of the Old-Continent is barren, and fetid; as in many countries of it there are prodigious multitudes of monſtrous inſects, noxious reptiles, and vile animals, as in the Philippine-Iſles, in many of thoſe of the Indian-Archipelago, in ſeveral countries of the ſouth of Aſia, in many of Africa, and even in ſome of Europe. The Philippine-Iſles are infeſted with enormous ants, and monſtrous butterflies; Japan with ſcorpions; ſouth of Aſia and Africa with ſerpents; Egypt with aſps; Guinea and Ethiopia with armies of ants; Holland with field-rats; Ukrania with toads, as M. de Pauw himſelf affirms. In Italy, the Campagna di Roma (although peopled for ſo many ages), is infeſted with vipers; Calabria with tarantulas; the ſhores of the Adriatic ſea with clouds of gnats; and even in France, the population of which is ſo great, and ſo ancient, whoſe lands are ſo well cultivated, and whoſe climate is ſo celebrated by the French, there

there appeared, a few years ago, according to M. Buffon, a new ſpecies of field-mice, larger than the common kind, called by him *Surmulots,* which have multiplied exceedingly, to the great damage of the fields. M. Bazin, in his Compendium of the Hiſtory of inſects, numbers 77 ſpecies of bugs, which are all found in Paris, and in its neighbourhood. That large capital, as Mr Bomare ſays, ſwarms with thoſe diſguſtful inſects. It is true that there are places in America, where the multitude of inſects, and filthy vermin, make life irkſome; but we do not know that they have arrived to ſuch exceſs of multiplication as to depopulate any place, at leaſt there cannot be ſo many examples produced of this cauſe of depopulation in the New as in the Old continent, which are atteſted by Theophraſtus, Varro, Pliny, and other authors. The frogs depopulated one place in Gaul, and the locuſts another in Africa. One of the Cyclades was depopulated by mice; Amiclas, near to Taracina, by ſerpents; another place, near to Ethiopia, by ſcorpions and poiſonous ants; and another by ſcolopendras; and, not ſo diſtant from our own times, the Mauritius was going to have been abandoned, on account of the extraordinary multiplication of rats, as we can remember to have read in a French author.

With reſpect to the ſize of the inſects, reptiles, and ſuch animals, M. de Pauw makes uſe of the teſtimony of M. Dumont, who, in his *Memoirs on Louiſiana,* ſays, that the frogs are ſo large there that they weigh 37 French pounds, and that their horrid croaking imitates the bellowing of cows. But, M. de Pauw himſelf ſays (in his anſwer to Don Pernetty, cap. 17.), that all thoſe who have written about Louiſiana, from Henepin, Le Clerc, and Tonti, to Dumont, have contradicted each other, ſometimes on one, and ſometimes on another, ſubject. In fact, neither in the old or the new continent are there frogs of 37 pounds in weight (ſee the article RANA); but there are in Aſia, and in Africa ſerpents, butterflies, ants, and other animals of ſuch monſtrous ſize, that they exceed all thoſe which have been diſcovered in the New-World. We know very well, that an American hiſtorian ſays, that a certain gigantic ſpecies of ſerpents is to be found in the woods, which attract men with their breath, and ſwallow them up; but we know alſo that ſeveral hiſtorians, both ancient and modern, report the ſame extravagant and incredible thing of the ſerpents of Aſia, and even ſomething more. Megaſthenes, cited by Pliny, ſaid, that there were ſerpents found in Aſia, ſo large, that they ſwallowed entire ſtags and bulls. Metrodorus, cited by the ſame author, affirms, that in Aſia there were ſerpents which, by their breath, attracted birds, however high they were, or quick their flight. Among the moderns, Gemelli, in Vol. V. of his *Giro del Mundo,* when he treats of the animals of the Philippine-Iſles, ſpeaks thus: "There are ſerpents in theſe iſlands of immoderate ſize: there is one called *Ibitin,* very long, which ſuſpending itſelf by the tale from the trunk of a tree, waits till ſtags, bears, and alſo men paſs by, in order to attract them with its breath, and devour them at once entirely:" from whence it is evident, that this very ancient fable has been common to both continents.

Further, it may be aſked, In what country of America could M. de Pauw find ants to equal thoſe of the Philippine-Iſlands, called *Sulum,* reſpecting which Hernandez affirms, that they are ſix fingers broad in length, and one in breadth? Who has ever ſeen in America butterflies ſo large as thoſe of Bourbon, Ternate, the Philippine-iſles, and all the Indian-Archipelago? The largeſt bat of America (native to hot ſhady countries), which is that called by Buffon *Vampiro,* is according to him, of the ſize of a pigeon. *La Rougette,* one of the ſpecies of Aſia, is as large as a raven; and the *Rouſette,* another ſpecies of Aſia, is as big as a large hen. Its wings, when extended, meaſure from tip to tip three Pariſian feet, and according to Gemelli, who meaſured it in the Philippine-iſles, ſix palms. M. Buffon acknowledges the exceſs in ſize of the Aſiatic bat over the American ſpecies, but denies it as to number. Gemelli ſays, that thoſe of the iſland of Luzon were ſo numerous that they darkened the air, and that the noiſe which they made with their teeth, in eating the fruits of the woods, was heard at the diſtance of two miles. M. de Pauw ſays, in talking of ſerpents, "it cannot be affirmed that the new world has ſhown any ſerpents larger than thoſe which Mr Adanſon ſaw in the deſarts of Africa." The greateſt ſerpent found in Mexico, after a diligent ſearch made by Hernandez, was 18 feet long: but this is not to be compared with that of the Moluccas, which Bomare ſays is 33 feet in length; nor with the *Anacandaja,* of Ceylon, which the ſame author ſays is more than 33 feet long; nor with others of Aſia and Africa, mentioned by the ſame author. Laſtly, the argument drawn from the multitude and ſize of the American inſects is fully as weighty as the argument drawn from the ſmallneſs and ſcarcity of quadrupeds, and both detect the ſame ignorance, or rather the ſame voluntary and ſtudied forgetfulneſs, of the things of the Old continent.

With reſpect to what M. de Pauw has ſaid of the tribute of lice, in Mexico, in that, as well as in many other things, he diſcovers his ridiculous credulity. It is true that Cortes found bags of lice in the magazines of the palace of king Axajacatl. It is alſo true, that Montezuma impoſed ſuch a tribute, not on all his ſubjects, however, but only on thoſe who were beggars; not on account of the extraordinary multitude of thoſe inſects, as M. de Pauw affirms, but becauſe Montezuma, who could not ſuffer idleneſs in his ſubjects, reſolved that that miſerable ſet of people, who could not labour, ſhould at leaſt be occupied in louſing themſelves. This was the true reaſon of ſuch an extraordinary tribute, as Torquemada, Betancourt, and other early hiſtorians relate; and nobody ever before thought of that which M. de Pauw affirms, merely becauſe it ſuited his prepoſterous ſyſtem. Thoſe diſguſting inſects poſſibly abound as much in the hair and clothes of American beggars, as of any poor and uncleanly low people in the world: but there is not a doubt, that if any ſovereign of Europe was to exact ſuch a tribute from the poor in his dominions, not only bags, but great veſſels might be filled with them.

13
General deſcription of the natives.

It is now time to turn our attention to the *Aborigines,* or natives, of the New-World. At the time when this great continent was made more generally known to the Europeans by the diſcoveries of Chriſtopher Columbus, and of the illuſtrious navigators who imbibed the ſpirit and enthuſiaſm of that great man, it was found inhabited by various tribes and nations of men, who differed, in many reſpects, from moſt of the people in the three other quarters of the world. In their phyſical hiſtory, however, the greateſt peculiarity in the Americans is their complexion, and the little difference which is obſerved, in this reſpect, throughout the whole extent of the American continent. In Europe, and in Aſia, the people who inhabit the northern countries are of a fairer complexion than thoſe who dwell more to the ſouthward. In the torrid zone, both in Africa and in Aſia, the natives are entirely black, or the next thing to it. This, however, muſt be underſtood with ſome limitation. The people of Lapland, who inhabit the moſt northerly part of Europe, are by no means ſo fair as the inhabitants of Britain; nor are the Tartars ſo fair as the inhabitants of Europe, who lie under the ſame parallels of latitude. Nevertheleſs, a Laplander is fair, when compared with an Abyſſinian, and a Tartar if compared with a native of the Molucca iſlands.—In America, this diſtinction of colour was not ſo diſtinctly, and ſo prominently, marked. In the torrid zone there were no negroes, and in the temperate and frigid zones there were no white people. Moſt of them were of a kind of red copper-colour, which Mr Forſter obſerved, in the Peſſerais, of Tierra del Fuego, to have ſomething of a gloſs reſembling that metal. It does not appear, however, that this matter has, hitherto, been inquired into with ſufficient accuracy. The inhabitants of the inland parts of South-America, where that continent is wideſt, and, conſequently, the influence of the ſun moſt powerful, have never been accurately compared with thoſe of Canada, or more northerly parts, at leaſt as far as we know. Yet this ought to have been done, and that in many inſtances too, before it could be aſſerted ſo poſitively, as moſt authors do, that *there is not the leaſt difference of complexion among the natives of America*. Indeed, ſo many ſyſtems have been formed concerning theſe ſingular people, that it is very difficult to obtain a true knowledge of the moſt ſimple facts, even from the beſt and moſt unprejudiced writers.—If we may believe the Abbé Raynal, the Californians are ſwarthier than the Mexicans; and ſo poſitive is he in this opinion, that he gives a reaſon for it. "This difference of colour," ſays he, "proves, that the civilized life of ſociety ſubverts, or totally changes, the order and laws of nature, ſince we find, under the temperate zone, a ſavage people that are blacker than the civilized nations of the torrid zone."—On the other hand, Dr Robertſon claſſes all the inhabitants of Spaniſh-America together with regard to colour, whether they are civilized or uncivilized; and when he ſpeaks of California, takes no notice of any peculiarity in their colour more than others.—The general appearance of the indigenous Americans in various diſtricts, is thus deſcribed by the chevalier Pinto: "They are all of a copper colour, with ſome diverſity of ſhade, not in proportion to their diſtance from the Equator, but according to the degree of elevation of the territory in which they reſide. Thoſe who live in a high country are fairer than thoſe in the marſhy low lands on the coaſt. Their face is round; farther removed, perhaps, than that of any people from an oval ſhape. Their fore-head is ſmall; the extremity of their ears far from the face; their lips thick; their noſe flat; their eyes black, or of a cheſnut colour, ſmall, but capable of diſcerning objects at a great diſtance. Their hair is always thick and ſleek, and without any tendency to curl. At the firſt aſpect, a South-American appears to be mild and innocent; but, on a more attentive view, one diſcovers in his countenance ſomething wild, diſtruſtful, and ſullen."

14 Don Ulloa's account.

The following account of the native Americans is given by Don Antonio Ulloa, in his late work entitled *Memoires philoſophiques, hiſtoriques, et phyſiques, concernant la decouverte de l'Amerique.*

The American Indians are naturally of a colour bordering upon red. Their frequent expoſure to the ſun and wind changes it to their ordinary duſky hue. The temperature of the air appears to have little or no influence in this reſpect. There is no perceptible difference in complexion between the inhabitants of the high and thoſe of the low parts of Peru; yet the climates are of an extreme difference. Nay, the Indians who live as far as 40 degrees and upwards ſouth or north of the equator, are not to be diſtinguiſhed, in point of colour, from thoſe immediately under it.

There is, alſo, a general conformation of features and perſon, which, more or leſs, characterizeth them all. Their chief diſtinctions, in theſe reſpects, are a ſmall forehead, partly covered with hair to the eyebrows, little eyes, the noſe thin, pointed, and bent towards the upper lip; a broad face, large ears, black, thick, and lank hair; the legs well formed, the feet ſmall, the body thick and muſcular; little or no beard on the face, and that little never extending beyond a ſmall part of the chin and upper lip. It may eaſily be ſuppoſed that this general deſcription cannot apply, in all its parts, to every individual; but all of them partake ſo much of it, that they may be eaſily diſtinguiſhed even from the mulattoes, who come neareſt to them in point of colour.

The reſemblance among all the American tribes is not leſs remarkable in reſpect to their genius, character, manners, and particular cuſtoms. The moſt diſtant tribes are, in theſe reſpects, as ſimilar as though they formed but one nation.

All the Indian nations have a peculiar pleaſure in painting their bodies of a red colour, with a certain ſpecies of earth. The mine of Guancavelica was formerly of no other uſe than to ſupply them with this material for dyeing their bodies; and the cinnabar extracted from it was applied entirely to this purpoſe. The tribes in Louiſiana and in Canada have the ſame paſſion; hence minium is the commodity moſt in demand there.

It may, perhaps, ſeem ſingular, that theſe nations, whoſe natural colour is red, ſhould affect the ſame colour as an artificial ornament. But, it may be obſerved, they do nothing in this reſpect but what correſponds to the practice of Europeans, who alſo ſtudy to heighten and diſplay to advantage the natural red and white of their complexions. The Indians of Peru have now, indeed, abandoned the cuſtom of painting their bodies: but it was common among them before they were conquered by the Spaniards; and it ſtill remains the cuſtom of all thoſe tribes who have preſerved their liberty. The northern nations of America, beſides the red colour which is predominant, employ alſo black, white, blue, and green, in painting their bodies.

15 Peculiarities in regard to ornament and dreſs.

The adjuſtment of theſe colours is a matter of as great conſideration with the Indians of Louiſiana and the vaſt regions extending to the north, as the ornaments of dreſs among the moſt poliſhed nations. The buſineſs itſelf they call *Maſtaher*, and they do not fail to apply all their talents and aſſiduity to accompliſh it in the moſt finiſhed manner. No lady of the greateſt faſhion ever conſulted her mirror with more anxiety, than the Indians do while painting their bodies. The colours are applied with the utmoſt accuracy and addreſs. Upon the eye-lids, preciſely at the root of the eye-laſhes, they draw two lines, as fine as the ſmalleſt thread; the ſame upon the lips, the openings of the noſtrils, the eye-brows, and the ears; of which laſt they even follow all the inflexions and ſinuoſities. As to the reſt of the face, they diſtribute various figures, in all which the red predominates, and the other colours are aſſorted ſo as to throw it out to the beſt advantage. The neck alſo receives its proper ornaments; a thick coat of vermilion commonly diſtinguiſhes the cheeks. Five or ſix hours are requiſite for accompliſhing all this with the nicety which they affect. As their firſt attempts do not always ſucceed to their wiſh, they efface them, and begin a-new upon a better plan. No coquette is more faſtidious in her choice of ornament, none more vain when the important adjuſtment is finiſhed. Their delight and ſelf-ſatisfaction are then ſo great, that the mirror is hardly ever laid down. An Indian, *Maſtached*, to his mind, is the vaineſt of all the human ſpecies. The other parts of the body are left in their natural ſtate, and, excepting what is called a *cachecul*, they go entirely naked.

Such of them as have made themſelves eminent for bravery, or other qualifications, are diſtinguiſhed by figures painted on their bodies. They introduce the colours by making punctures on their ſkin, and the extent of ſurface which this ornament covers is proportioned to the exploits they have performed. Some paint only their arms, others both their arms and legs; others, again, their thighs, while thoſe who have attained the ſummit of warlike renown have their bodies painted from the waiſt upwards. This is the heraldry of the Indians; the devices of which are, probably, more exactly adjuſted to the merits of the perſons who bear them, than thoſe of more civilized countries.

Beſides theſe ornaments, the warriors alſo carry plumes of feathers on their heads, their arms, and ancles. Theſe, likewiſe, are tokens of valour, and none but ſuch as have been thus diſtinguiſhed may wear them.

The propenſity to indolence is equal among all the tribes of Indians, civilized, or ſavage. The only employment of thoſe who have preſerved their independence is hunting and fiſhing. In ſome diſtricts, the women exerciſe a little agriculture, in raiſing Indian corn, and pompions, of which they form a ſpecies of aliment, by bruiſing them together: they, alſo, prepare the ordinary beverage in uſe among them, taking care, at the ſame time, of the children, of whom the fathers take no charge.

The female Indians of all the conquered regions of South-America practiſe what is called the *urcu* (a word which among them ſignifies *elevation*). It conſiſts in throwing forward the hair from the crown of the head, upon the brow, and cutting it round from the ears to above the eye; ſo that the forehead and eye-brows are entirely covered. The ſame cuſtom takes place in the Northern countries. The female inhabitants of both regions tie the reſt of their hair behind, ſo exactly on the ſame faſhion, that it might be ſuppoſed the effect of mutual imitation. This, however, being impoſſible, from the vaſt diſtance that ſeparates them, is thought to countenance the ſuppoſition of the whole of America being originally planted with one race of people.

This cuſtom does not take place among the males. Thoſe of the higher parts of Peru wear long and flowing hair, which they reckon a great ornament. In the lower parts of the ſame country they cut it ſhort, on account of the heat of the climate; a circumſtance in which they imitate the Spaniards. The inhabitants of Louiſiana pluck out their hair by the root, from the crown of the head forwards, in order to obtain a large forehead, otherwiſe, denied them by nature. The reſt of their hair they cut as ſhort as poſſible, to prevent their enemies from ſeizing them by it in battle, and alſo to prevent them from eaſily getting their ſcalp, ſhould they fall into their hands as priſoners.

16
Remarkable inſenſibility to pain.

According to Don Ulloa, the whole race of the American Indians is diſtinguiſhed by an uncommon thickneſs of ſkin, and by an hardneſs of their fibres; circumſtances theſe, which, in the opinion of this learned Spaniſh writer, contribute to that inſenſibility to bodily pain, for which theſe ſingular people are ſo remarkable. Our author adduces an inſtance, in ſupport of this inſenſibility, in the Americans, in the caſe of an Indian, who was under the neceſſity of ſubmitting to be cut for the ſtone. This operation, it is well known, ſeldom laſts above four, or five, minutes. Unfavourable circumſtances, in his caſe, prolonged it to the uncommon period of 27 minutes. Yet, all this time, the patient gave no tokens of the extreme pain, commonly attending this operation: he complained only as a perſon does who feels ſome ſligh tuneaſineſs. At laſt, the ſtone was extracted. Two days after, he expreſſed a deſire for food, and on the eighth day from the operation he quitted his bed, free from pain, although the wound was not yet thoroughly cloſed. The ſame want of ſenſibility, he ſays, is obſerved in caſes of fractures, wounds, and other accidents, of a ſimilar nature. In all theſe caſes, their cure is eaſily effected, and they ſeem to ſuffer leſs preſent pain than any other race of men. The ſkulls, which have been taken up in their ancient burying-grounds, are of a greater thickneſs than that compages of bones is commonly found to be; being from ſix to ſeven lines from the outer to the inner ſuperficies.

17
And to the inclemencies of weather.

It is natural to infer from hence, ſays Ulloa, that their comparative inſenſibility to pain is owing to a coarſer and ſtronger organization, than that of other nations. The eaſe with which they endure the ſeverities of climate is, he thinks, another proof of this. The inhabitants of the higher parts of Peru live amidſt perpetual froſt and ſnow. Although their clothing is very ſlight, they ſupport this inclement temperature, without the leaſt inconvenience. Habit, it is to be confeſſed, may contribute a good deal to this, but much alſo is to be aſcribed to the compact texture of their ſkin, which defends them from the impreſſion of cold through their pores. We muſt confeſs, however, notwithſtanding the aſſertions and conjectures of an author ſo reſpectable as Don Ulloa, that we are not very confident, that either the ſkins, or the ſkulls of the Americans are thicker than the ſkins and ſkulls of many other nations of mankind. But we do not wiſh, in this place, to expatiate on this ſubject, which can only be reduced to certainty by the inveſtigations of the anatomiſt, or naturaliſt.

The northern Indians reſemble them in this reſpect. The utmoſt rigours of the winter ſeaſon do not prevent them from following the chace almoſt naked. It is true, they wear a kind of woollen cloak, or ſometimes the ſkin of a wild beaſt, upon their ſhoulders; but, beſides that it covers only a ſmall part of their body, it would appear that they uſe it rather for ornament than warmth. In fact, they wear it indiſcriminately, in the ſeverities of winter, and in the ſultrieſt heats of ſummer, when neither Europeans nor Negroes can ſuffer any but the ſlighteſt cloathing. They even frequently throw aſide this cloak when they go a-hunting, that it may not embarraſs them, in traverſing their foreſts, where, they ſay, the thorns and undergrowth would take hold of it; while, on the contrary, they ſlide ſmoothly over the ſurface of their naked bodies. At all times, they go with their heads uncovered, without ſuffering the leaſt inconvenience, either from the cold, or from thoſe *coups de ſoleil*, which in Louiſiana are ſo often fatal to the inhabitants of other climates.

18
Terrible trials undergone by their chiefs.

The Indians of South-America diſtinguiſh themſelves by modern dreſſes, in which they affect various taſtes. Thoſe of the high country, and of the valleys in Peru, dreſs partly in the Spaniſh faſhion. Inſtead of hats they wear bonnets of coarſe double cloth, the weight of which neither ſeems to incommode them when they go to warmer climates, nor does the accidental want of them ſeem to be felt in ſituations where the moſt piercing cold reigns. Their legs and feet are always bare, if we except a ſort of ſandals, made of the ſkins of oxen. The inhabitants of South-America, compared with thoſe of North-America, are deſcribed as generally more feeble in their frame; leſs vigorous in the efforts of their mind; of gentler diſpoſitions, more addicted to pleaſure, and ſunk in indolence.—This, however, is not univerſally the caſe. Many of their nations are as intrepid and enterpriſing as any others on the whole continent. Among the tribes on the banks of the Oroonoko, if a warrior aſpires to the poſt of captain, his probation begins with a long faſt, more rigid than any ever obſerved by the moſt abſtemious hermit. At the cloſe of this the chiefs aſſemble; and each gives him three laſhes with a large whip, applied ſo vigorouſly, that his body is almoſt flayed. If he betrays the leaſt ſymptom of impatience, or even of ſenſibility, he is diſgraced, for ever, and is rejected, as unworthy of the honour. After ſome interval, his conſtancy is proved by a more excruciating trial. He is laid in his hammock with his hands bound faſt; and an innumerable multitude of venomous ants, whoſe bite occaſions a violent pain and inflammation, are thrown upon him. The judges of his merit ſtand around the hammock; and whilſt theſe cruel inſects faſten upon the moſt ſenſible parts of his body, a ſigh, a groan, or an involuntary motion, expreſſive of what he ſuffers, would exclude him from the dignity of which he is ambitious. Even after this evidence, his fortitude is not deemed to be ſufficiently aſcertained, till he has ſtood another teſt, more ſevere, if poſſible, than the former. He is again ſuſpended in his hammock, and covered with the leaves of the palmetto. A fire of ſtinking herbs is kindled underneath, ſo as he may feel its heat, and be involved in ſmoke. Though ſcorched and almoſt ſuffocated, he muſt continue to endure this with the ſame patient inſenſibility. Many periſh in this eſſay of their firmneſs and courage; but ſuch as go through it with applauſe, receive the enſigns of their new dignity with much ſolemnity, and are ever after regarded as leaders of approved reſolution, whoſe behaviour, in the moſt trying ſituations, will do honour to their country. In North-America, the previous trial of a warrior is neither ſo formal, nor ſo ſevere; though, even there, before a youth is permitted to bear arms, his patience and fortitude are proved by blows, by fire, and by inſults, more intolerable to a haughty ſpirit than either.

19
Cuſtoms and diſp ſitions of the Nort America more pa cularly.

Of the manners and cuſtoms of the North-Americans more particularly, the following is the moſt conſiſtent account that can be collected from the beſt informed and moſt impartial writers.

When the Europeans firſt arrived in America, they found the Indians quite naked, except thoſe parts which even the moſt uncultivated people uſually conceal. Since that time, however, they generally uſe a coarſe blanket, which they buy of the neighbouring planters.

Their huts, or cabbins, are made of ſtakes of wood driven into the ground, and covered with branches of trees, or reeds. They lie on the floor, either on mats, or the ſkins of wild beaſts. Their diſhes are of timber; but their ſpoons are made of the ſkulls of wild oxen, and their knives of flint. A kettle and a large plate conſtitute almoſt the whole utenſils of the family.—Their diet conſiſts chiefly in what they procure by hunting; and ſagamite, or pottage, is likewiſe one of their moſt common kinds of food. The moſt honourable furniture amongſt them is a collection of the ſcalps of their enemies; with theſe they ornament their huts, which are eſteemed in proportion to the number of this ſort of ſpoils.

20
Their r markab penſive and tac turnity.

The character of the Indians is altogether founded upon their circumſtances and way of life. A people who are conſtantly employed in procuring the means of a precarious ſubſiſtence, who live by hunting the wild animals, and who are generally engaged in war with their neighbours, cannot be ſuppoſed to enjoy much gaiety of temper, or a high flow of ſpirits. The Indians, therefore, are in general grave, even to ſadneſs: they have nothing of that giddy vivacity peculiar to ſome nations of Europe, and they deſpiſe it. Their behaviour to thoſe about them is regular, modeſt, and reſpectful. Ignorant of the arts of amuſement, of which that of ſaying trifles agreeably is one of the moſt conſiderable, they ſeldom ſpeak but when they have ſomething important to obſerve; and all their actions, words, and even looks, are attended with ſome meaning. This is extremely natural to men who are almoſt continually engaged in purſuits, which to them are of the higheſt importance. Their ſubſiſtence depends entirely on what they procure with their hands; and, their lives, their honour, and every thing dear to them, may be loſt by the ſmalleſt inattention to the deſigns of their enemies. As they have no particular object to attach them to one place rather than another, they go wherever they expect to find the neceſſaries of life in greateſt abundance. Cities, which are the effects of agriculture and arts, they have none. The different tribes, or nations, are, for the ſame reaſon, extremely ſmall, when compared with civilized ſocieties, in which induſtry, arts, agriculture, and commerce, have united a vaſt number of individuals, whom a complicated luxury renders uſeful to one another. Theſe ſmall tribes live at an immenſe diſtance; they are ſeparated by a deſert frontier, and hid in the boſom of impenetrable and almoſt boundleſs foreſts.

21
Form of government among hem.

There is eſtabliſhed in each ſociety a certain ſpecies of government, which prevails over the whole continent of America, with exceeding little variation; becauſe over the whole of this continent the manners and way of life are nearly ſimilar and uniform. Without arts, riches, or luxury, the great inſtruments of ſubjection in poliſhed ſocieties, an American has no method by which he can render himſelf conſiderable among his companions, but by ſuperiority in perſonal qualities of body or mind. But, as Nature has not been very laviſh in her perſonal diſtinctions, where all enjoy the ſame education, all are pretty much upon an equality, and will deſire to remain ſo. Liberty, therefore, is the prevailing paſſion of the Americans; and their government, under the influence of this ſentiment, is, perhaps, better ſecured than by the wiſeſt political regulations. They are very far, however, from deſpiſing all ſort of authority: they are attentive to the voice of wiſdom, which experience has conferred on the aged, and they enliſt under the banners of the chief in whoſe valour and military addreſs they have learned to repoſe a juſt and merited confidence. In every ſociety, therefore, there is to be conſidered the power of the chiefs and of the elders. Among thoſe tribes which are moſt engaged in war, the power of the chief is, naturally, predominant; becauſe the idea of having a military leader was the firſt ſource of his ſuperiority, and the continual exigencies of the ſtate requiring ſuch a leader, will continue to ſupport, and even to enhance it. His power, however, is rather perſuaſive than coercive; he is reverenced as a father, rather than feared as a monarch. He has no guards, no priſons, no officers of juſtice, and one act of ill-judged violence would pull him from his humble throne. The elders in the other form of government which may be conſidered as a *mild* and *nominal* ariſtocracy, have no more power. In moſt countries, therefore, age alone is ſufficient for acquiring reſpect, influence, and authority. It is age which teaches experience, and experience is the only ſource of knowledge among a ſavage people. Among thoſe perſons buſineſs is conducted with the utmoſt ſimplicity, and which may recal, to thoſe who are acquainted with antiquity, a picture of the moſt early ages. The heads of families meet together in a houſe or cabin appointed for the purpoſe. Here the buſineſs is diſcuſſed; and here thoſe of the nation, diſtinguiſhed for their eloquence or wiſdom, have an opportunity of diſplaying thoſe talents. Their orators, like thoſe of Homer, expreſs themſelves in a bold figurative ſtyle, ſtronger than refined, or rather ſoftened, nations can well bear, and with geſtures equally violent, but often extremely natural and expreſſive. When the buſineſs is over, and they happen to be well provided with food, they appoint a feaſt upon the occaſion, of which almoſt the whole nation partakes. The feaſt is accompanied with a ſong, in which the real or fabulous exploits of their forefathers are celebrated. They have dances too, though, like thoſe of the Greeks and Romans, they are chiefly of the military kind; and their muſic and dancing accompany every feaſt.

22
Their pubc aſſemlies.

23
Wampum or belts.

To aſſiſt their memory, they have belts of ſmall ſhells, or beads, of different colours, each repreſenting a particular object, which is marked by their colour and arrangement. At the concluſion of every ſubject on which they diſcourſe, when they treat with a foreign ſtate, they deliver one of thoſe belts; for if this ceremony ſhould be omitted, all that they have ſaid paſſes for nothing. Theſe belts are carefully depoſited in each town, as the public records of the nation; and to them they occaſionally have recourſe, when any public conteſt happens with a neighbouring tribe. Of late, as the materials of which thoſe belts are made, have become ſcarce, they often give ſome ſkin in place of the wampum (the name of the beads), and receive, in return, preſents of a more valuable kind from the commiſſioners; for they never conſider a treaty as of any weight, unleſs every article in it be ratified by ſuch a gratification.

It often happens, that thoſe different tribes or nations, ſcattered as they are at an immenſe diſtance from one another, meet in their excurſions after prey. If there ſubſiſts no animoſity between them, which ſeldom is the caſe, they behave in the moſt friendly and courteous manner; but if they happen to be in a ſtate of war, or if there has been no previous intercourſe between them, all who are not friends are deemed enemies, and they fight with the moſt ſavage fury.

24
Their wars

If we except hunting and fiſhing, war is the principal employment of the Indian men: almoſt every other concern, but in particular the little agriculture which they enjoy, is conſigned to the women. The moſt common motive of the Americans for entering into war, when it does not ariſe from an accidental rencounter, or interference, is either to revenge themſelves for the death of ſome loſt friends, or to acquire priſoners, who may aſſiſt them in their hunting, and whom they adopt into their ſociety. Theſe wars are either undertaken by ſome private adventurers, or at the inſtance of the whole community. In the latter caſe, all the young men who are diſpoſed to go out to battle (for no one is compelled contrary to his inclination), give a bit of wood to the chief, as a token of their deſign to accompany him; for every thing among theſe people is tranſacted with a great deal of ceremony and with many forms. The chief, who is to conduct them faſts ſeveral days, during which time he converſes with no one, and is particularly careful to obſerve his dreams; which the preſumption natural to ſavages generally renders as favourable as he could deſire. A variety of other ſuperſtitions and ceremonies are obſerved. One of the moſt hideous is ſetting the war-kettle on the fire, as an emblem that they are going out to devour their enemies; which, among theſe nations, it is probable, was formerly the caſe, ſince they ſtill continue to expreſs it in clear terms, and uſe an emblem ſignificant of the ancient uſage. Then, they diſpatch a porcelane, or large ſhell, to their allies, inviting them to come along, and drink the blood of their enemies. For with the Americans, as with the Greeks of old,

> " A generous friendſhip no cold medium knows;
> " But with one love, with one reſentment glows."

25
Ceremonies before ſetting out.

They think that thoſe in their alliance muſt not only adopt their enmities, but that they muſt alſo have their reſentment wound up to the ſame pitch with themſelves. And, indeed, no people carry their friendſhips or their reſentments ſo far as they do; and this is what ſhould be expected from their peculiar circumſtances: that principle in human nature which is the ſpring of the ſocial affections, acts with ſo much the greater force the more it is reſtrained. The Americans, who live in ſmall ſocieties, who ſee few objects and few perſons, become wonderfully attached to thoſe objects and perſons, and cannot be deprived of them without feeling themſelves miſerable. Their ideas are too confined to enable them to entertain juſt ſentiments of humanity, or univerſal benevolence. But this very circumſtance, while it makes them cruel and ſavage to an incredible degree, towards thoſe with whom they are at war, adds a new force to their particular friendſhips, and to the common tie which unites the members of the ſame tribe, or of thoſe different tribes which are in alliance with one another. Without attending to this reflection, ſome facts we are going to relate would excite our wonder without informing our reaſon, and we would be bewildered in a number of particulars, ſeemingly oppoſite to one another, without being ſenſible of the general cauſe from which they proceed.

Having finiſhed all the ceremonies previous to the war, and the day appointed for their ſetting out on the expedition being arrived, they take leave of their friends, and exchange their clothes, or whatever moveables they have, in token of mutual friendſhip; after which they proceed from the town, their wives and female relations walking before, and attending them to ſome diſtance. The warriors march all dreſſed in their fineſt apparel and moſt ſhowy ornaments, without any order. The chief walks ſlowly before them, ſinging the war-ſong, while the reſt obſerve the moſt profound ſilence. When they come up to their women, they deliver them all their finery, and putting on their worſt clothes, proceed on their expedition.

26 **Enſigns.** Every nation has its peculiar enſign or ſtandard, which is generally a repreſentation of ſome beaſt, bird, or fiſh. Thoſe among the Five-Nations are the bear, otter, wolf, tortoiſe, and eagle; and by thoſe names the tribes are uſually diſtinguiſhed. They have the figures of thoſe animals pricked and printed on ſeveral parts of their bodies; and when they march through the woods, they commonly, at every encampment, cut the repreſentation of their enſign on trees, eſpecially after a ſucceſsful campaign: marking at the ſame time the number of ſcalps or priſoners they have taken. 27 **Military habits.** Their military dreſs is extremely ſingular. They cut off, or pull out, all their hair, except a ſpot about the breadth of two Engliſh crown-pieces, near the top of their heads, and entirely deſtroy their eye-brows. The lock left upon their heads is divided into ſeveral parcels, each of which is ſtiffened and adorned with wampum, beads, and feathers of various kinds, the whole being twiſted into a form much reſembling the modern pompoon. Their heads are painted red down to the eye-brows, and ſprinkled over with white down. The griſtles of their ears are ſplit almoſt quite round, and diſtended with wires or ſplinters, ſo as to meet and tie together on the nape of the neck. Theſe are, alſo, hung with ornaments, and, generally, bear the repreſentation of ſome bird, or beaſt. Their noſes are likewiſe bored and hung with trinkets of beads, and their faces painted, with various colours, ſo as to make an awful appearance. Their breaſts are adorned with a gorget, or medal, of braſs, copper, or ſome other metal; and that dreadful weapon the ſcalping-knife hangs by a ſtring from the neck.

28 **Quickneſs of their ſenſes.** The great qualities of an Indian war are vigilance and attention, to give and avoid a ſurpriſe; and, indeed, in theſe they are ſuperior to all nations, in the world. Accuſtomed to continual wandering in the foreſts; having their perceptions ſharpened by keen neceſſity, and living, in every reſpect, according to nature, their external ſenſes have a degree of acuteneſs which, at firſt view, appears incredible. They can trace out their enemies, at an immenſe diſtance, by the ſmoke of their fires, which they ſmell, and by the tracks of their feet upon the ground, imperceptible to an European eye, but which they can count and diſtinguiſh, with the utmoſt facility. It is ſaid, they can even diſtinguiſh the different nations with whom they are acquainted, and can determine the preciſe time when they paſſed, where an European could not, with all his glaſſes, diſtinguiſh footſteps at all. Theſe circumſtances, however, are of leſs importance, becauſe their ſavage enemies are equally well acquainted with them. 29 **Vigilance and circumſpection.** When they go out, therefore, they take care to avoid making uſe of any thing by which they might run the danger of a diſcovery. They light no fire to warm themſelves, or to prepare their victuals: they lie cloſe to the ground all day, and travel only in the night; and marching along in files, he that cloſes the rear, diligently covers with leaves the tracks of his own feet and of theirs who preceded him. When they halt to refreſh themſelves, ſcouts are ſent out to reconnoitre the country and beat up every place where they ſuſpect an enemy to lie concealed. In this manner they enter unawares the villages of their foes; and while the flower of the nation are engaged in hunting, maſſacre all the children, women, and helpleſs old men, or make priſoners of as many as they can manage, or have ſtrength enough to be uſeful to their nation. But when the enemy is appriſed of their deſign, and coming on in arms againſt them, they throw themſelves flat on the ground among the withered herbs and leaves, which their faces are painted to reſemble. 30 **Manner of fighting.** They then allow a part to paſs unmoleſted, when, all at once, with a tremendous ſhout, riſing up from their ambuſh, they pour a ſtorm of muſket-bullets on their foes. The party attacked returns the ſame cry. Every one ſhelters himſelf with a tree, and returns the fire of the adverſe party, as ſoon as they raiſe themſelves from the ground to give a ſecond fire. Thus does the battle continue until the one party is ſo much weakened as to be incapable of farther reſiſtance. But if the force on each ſide continues nearly equal, the fierce ſpirits of the ſavages, inflamed by the loſs of their friends, can no longer be reſtrained. They abandon their diſtant war, they ruſh upon one another, with clubs and hatchets in their hands, magnifying their own courage, and inſulting their enemies with the bittereſt reproaches. A cruel combat enſues, death appears in a thouſand hideous forms, which would congeal the blood of civilized nations to behold, but which rouſes the fury of ſavages. They trample, they

inſult, over the dead bodies, and tear the ſcalp from the head. The flame rages on till it meets with no reſiſtance; then the priſoners are ſecured, thoſe unhappy men, whoſe fate is a thouſand times more dreadful than theirs who have died in field. The conquerors ſet up a hideous howling, to lament the friends they have loſt. They approach, in a melancholy and ſevere gloom, to their own village; a meſſenger is ſent to announce their arrival, and the women, with frightful ſhrieks, come out to mourn their dead brothers, or their huſbands. When they are arrived, the chief relates, in a low voice, to the elders, a circumſtantial account of every particular of the expedition. The orator proclaims aloud this account to the people; and as he mentions the names of thoſe who have fallen, the ſhrieks of the women are redoubled. The men, too, join in theſe cries, according as each is moſt connected with the deceaſed by blood, or friendſhip. The laſt ceremony is the proclamation of the victory; each individual then forgets his private misfortunes, and joins in the triumph of his nation; all tears are wiped from their eyes, and, by an unaccountable tranſition, they paſs, in a moment, from the bitterneſs of ſorrow to an extravagance of joy. But the treatment of the priſoners, whoſe fate remains all this time undecided, is what chiefly characteriſes the ſavages.

We have already mentioned the ſtrength of their affections, or reſentments. United, as they are, in ſmall ſocieties, connected, within themſelves, by the firmeſt ties, their friendly affections, which glow with the moſt intenſe warmth within the walls of their own village, ſeldom extend beyond them. They feel nothing for the enemies of their nation; and their reſentment is eaſily extended, from the individual who has injured them, to all others of the ſame tribe. The priſoners who have themſelves the ſame feelings, know the intentions of their conquerers, and are prepared for them.

31
reatment
their pri-
ners.

The perſon who has taken the captive attends him to the cottage, where, according to the diſtribution made by the elders, he is to be delivered to ſupply the loſs of a citizen. If thoſe who receive him have their family weakened by war or other accidents, they adopt the captive into the family, of which he becomes a member. But if they have no occaſion for him, or their reſentment for the loſs of their friends be too high to endure the ſight of any connected with thoſe who were concerned in it, they ſentence him to death. All thoſe who have met with the ſame ſevere ſentence being collected, the whole nation is aſſembled at the execution, as for ſome great ſolemnity. A ſcaffold is erected, and the priſoners are tied to the ſtake, where they commence their death-ſong, and prepare for the enſuing ſcene of cruelty with the moſt undaunted courage. Their enemies, on the other ſide, are determined to put it to the proof, by the moſt refined and exquiſite tortures. They begin at the extremity of his body, and, gradually, approach the more vital parts.

32
hocking
ortures.

One plucks out his nails by the roots, one by one; another takes a finger into his mouth, and tears off the fleſh with his teeth; a third thruſts the finger, mangled as it is, into the bowl of a pipe made red-hot, which he ſmokes like tobacco; then they pound his toes and fingers to pieces between two ſtones; they cut circles about his joints, and gaſhes in the fleſhy parts of his limbs, which they ſear immediately with red-hot irons, cutting, burning, and pinching them, alternately; they pull off his fleſh, thus mangled and roaſted, bit by bit, devouring it with greedineſs, and ſmearing their faces with the blood, in an enthuſiaſm of horror and fury. When they have thus torn off the fleſh, they twiſt the bare nerves and tendons about an iron, tearing and ſnapping them, whilſt others are employed in pulling and extending his limbs in every way that can increaſe the torment. This continues, often, five or ſix hours; and ſometimes, ſuch is the ſtrength of the ſavages, days together. Then they frequently unbind him, to give a breathing to their fury, to think what new torments they ſhall inflict, and to refreſh the ſtrength of the ſufferer, who, wearied out with ſuch a variety of unheard-of torments, often falls into ſo profound a ſleep, that they are obliged to apply the fire to awake him, and renew his ſufferings. He is again faſtened to the ſtake, and again they renew their cruelty; they ſtick him all over with ſmall matches of wood that eaſily takes fire, but burns ſlowly; they continually run ſharp reeds into every part of his body; they drag out his teeth with pincers, and thruſt out his eyes; and, laſtly, after having burned his fleſh from the bones with ſlow fires; after having ſo mangled the body that it is all but one wound; after having mutilated his face in ſuch a manner as to carry nothing human in it; after having peeled the ſkin from the head, and poured a heap of red-hot coals or boiling water on the naked ſkull—they once more unbind the wretch; who, blind, and ſtaggering with pain and weakneſs, aſſaulted and pelted on every ſide with clubs and ſtones, now up, now down, falling into their fires at every ſtep, runs hither and thither, until one of the chiefs, whether out of compaſſion, or weary of cruelty, puts an end to his life with a club or dagger. The body is then put into a kettle, and this barbarous employment is ſucceeded by a feaſt as barbarous.

The women, forgetting the human as well as the female nature, and transformed into ſomething worſe than furies, are ſaid to ſurpaſs even the men in this ſcene of horror; while the principal perſons of the country ſit round the ſtake, ſmoking and looking on, without the leaſt emotion. What is moſt extraordinary, the ſufferer himſelf, in the little intervals of his torments, ſmokes too, appears unconcerned, and converſes with his torturers about indifferent matters.

33
Conſtancy
of the ſuf-
ferers.

Indeed, during the whole time of his execution, there ſeems a conteſt which ſhall exceed, they in inflicting the moſt horrid pains, or he in enduring them with a firmneſs and conſtancy almoſt above human: not a groan, not a ſigh, not a diſtortion of countenance, eſcapes him: he poſſeſſes his mind entirely in the midſt of his torments: he recounts his own exploits: he informs them what cruelties he has inflicted upon their countrymen; and threatens them with the revenge that will attend his death; and, though his reproaches exaſperate them, to a perfect madneſs of rage and fury, he continues his inſults even of their ignorance of the art of tormenting, pointing out himſelf more exquiſite methods, and more ſenſible parts of the body to be afflicted. The women have this part of courage as well as the men; and it is as rare for an Indian to behave otherwiſe as it would be for any European to ſuffer as an Indian. Such is the wonderful power of an early inſtitution, and a ferocious thirſt of glory! "I am brave and intrepid (exclaims the ſavage in the face of his tormentors); I do not fear death, nor any kind of tortures; thoſe who fear them are cowards; they are leſs than women; life is nothing to thoſe that have courage. May my enemies be confounded with deſpair and rage! Oh! that I could devour them, and drink their blood to the laſt drop."

34
Surpriſing contraſt in the American character.

But neither the intrepidity, on one ſide, nor the inflexibility, on the other, are among themſelves matter of aſtoniſhment: for vengeance, and fortitude, in the midſt of torment, are duties which they conſider as ſacred; they are the effects of their earlieſt education, and depend upon principles inſtilled into them from their infancy. On all other occaſions they are humane and compaſſionate. Nothing can exceed the warmth of their affection towards their friends, who conſiſt of all thoſe who live in the ſame village, or are in alliance with it: among theſe all things are common; and this, though it may in part, and among ſome of the tribes, ariſe from their not poſſeſſing very diſtinct notions of ſeparate property, is chiefly to be attributed to the ſtrength of their attachment: becauſe, in every thing elſe, with their lives as well as their fortunes, they are ready to ſerve their friends. Their houſes, their proviſion, even their young women, are not enough to oblige a gueſt. Has any one of theſe ſucceeded ill in his hunting? Has his harveſt failed? or is his houſe burned? He feels no other effect of his misfortunes, than that it gives him an opportunity to experience the benevolence and regard of his fellow-citizens. On the other hand, to the enemies of his country, or to thoſe who have privately offended, the American is implacable. He conceals his ſentiments; he appears reconciled until by ſome treachery or ſurpriſe he has an opportunity of executing an horrible revenge. No length of time is ſufficient to allay his reſentment; no diſtance of place great enough to protect the object; he croſſes the ſteepeſt mountains; he pierces the moſt impracticable foreſts, and traverſes the moſt hideous bogs and deſarts, for ſeveral hundreds of miles; bearing the inclemency of the ſeaſon, the fatigue of the expedition, the extremes of hunger and thirſt, with patience and cheerfulneſs, in hopes of ſurpriſing his enemy, on whom he exerciſes the moſt ſhocking barbarities, even to the eating of his fleſh. To ſuch extremes do the Indians puſh their friendſhip or their enmity; and ſuch indeed, in general, is the character of all ſtrong and uncultivated minds.

35
Treatment of their dead friends.

But what we have ſaid reſpecting the Indians would be a faint picture, did we omit obſerving the force of their friendſhip, which principally appears by the treatment of their dead. When any one of the ſociety is cut off, he is lamented by the whole: on this occaſion a variety of ceremonies are practiſed, denoting the moſt lively ſorrow. No buſineſs is tranſacted, however preſſing, till all the pious ceremonies due to the dead are performed. The body is waſhed, anointed, and painted. Then, the women lament the loſs with hideous howlings, intermixed with ſongs which celebrate the great actions of the deceaſed and his anceſtors. The men mourn alſo, though in a leſs extravagant manner. The whole village is preſent at the interment, and the corpſe is habited in their moſt ſumptuous ornaments. Cloſe to the body of the defunct are placed his bows and arrows, with whatever he valued moſt in his life, and a quantity of proviſion for his ſubſiſtence on the journey which he is ſuppoſed to take. This ſolemnity, like every other, is attended with feaſting. The funeral being ended, the relations of the deceaſed confine themſelves to their huts, for a conſiderable time, to indulge their grief. After an interval of ſome weeks, they viſit the grave, repeat their ſorrow, new-clothe the remains of the body, and act over again all the ſolemnities of the funeral.

Among the various tokens of their regard for their deceaſed friends, the moſt remarkable is the ceremony which they call the *feaſt of the dead*, or the *feaſt of ſouls*. The day for this ceremony is appointed in the council of their chiefs, who give orders for every thing which may enable them to celebrate it with pomp and magnificence; and the neighbouring nations are invited to partake of the entertainment. At this time, all who have died ſince the preceding feaſt of the kind are taken out of their graves. Even thoſe who have been interred at the greateſt diſtance from the villages, are diligently ſought for, and conducted to this rendezvous of the dead, which exhibits a ſcene of horror beyond the power of deſcription. When the feaſt is concluded, the bodies are dreſſed in the fineſt ſkins which can be procured, and after being expoſed for ſome time in this pomp, are again committed to the earth, with great ſolemnity, which is ſucceeded by funeral games.

36
Superſtitions.

Their taſte for war, which forms the chief ingredient in their character, gives a ſtrong bias to their religion. *Areſkoui*, or the god of battle, is revered as the great god of the Indians. Him they invoke before they go into the field; and according as his diſpoſition is more or leſs favourable to them, they conclude they will be more or leſs ſucceſsful. Some nations ſeem to do a kind of homage to the ſun, as a ſymbol, or miniſter, of the beneficence and power of the *Great Spirit*: others pay a ſimilar homage to the moon and planets; among others, there is a number of traditions, relative to the creation of the world and the hiſtory of the gods: traditions which reſemble the Grecian fables, but which are ſtill more abſurd and inconſiſtent. But religion is not the prevailing character of the Indians; and except when they have ſome immediate occaſion for the aſſiſtance of their gods, they pay them no ſort of worſhip. Like all rude nations, however, they are ſtrongly addicted to ſuperſtition. They believe in the exiſtence of a number of good and bad genii, or ſpirits, who interfere in the affairs of mortals, and produce all our happineſs, or miſery. It is from the evil genii, in particular, that our diſeaſes, they imagine, proceed; and it is to the good genii we are indebted for a cure. The miniſters of the genii are the jugglers, who are alſo the chief phyſicians among the ſavages. Theſe jugglers are ſuppoſed to be inſpired by the good genii, moſt commonly in their dreams, with the knowledge of future events: they are called in to the aſſiſtance of the ſick, and are ſuppoſed to be informed by the genii whether they will get over the diſeaſe, and in what way they muſt be treated. But theſe ſpirits are extremely ſimple in their ſyſtem of phyſic, and, in almoſt every diſeaſe, direct the juggler to the ſame remedy. The patient is incloſed in a narrow cabin, in the midſt of which is a ſtone red-hot; on this they throw water, until he is well ſoaked with the warm vapour and his own ſweat. Then they hurry him from this bagnio, and plunge him ſuddenly into the next river. This coarſe method, which coſts many their lives, often performs very extraordinary cures. "Some of their remedies, however, which are almoſt entirely derived from the vegetable kingdom, are certainly very powerful and efficacious, in their operation. The principal of theſe are a ſpecies of ſtillingia (perhaps a croton), ſeveral ſpecies of iris, particularly the verſicolor, and the verna; the bignonia crucigera, &c."—Theſe are principally employed by the jugglers, and old women; but moſt of the ſavages are more or leſs dextrous in curing wounds, and diſeaſes. But the power of their remedies is generally attributed by the ſavages to the magical ceremonies with which they are adminiſtered.

37 ondition their omen.

Although the Indian women generally bear the laborious part of the domeſtic œconomy, their condition, at leaſt among many of the tribes, is far from being ſo wretched, ſo ſlaviſh, and depreſſed, as has been repreſented, by Dr Robertſon, and by many other writers. We do not mean, in this place, to engage in an inquiry concerning the comparative reſpectability and importance of the female character in the various ſtages of ſociety and improvement: an inquiry this which has employed the pens of ſome of the moſt learned and eloquent writers of the preſent age, and concerning which there are ſtill various, and very oppoſite, opinions. This, however, we think, we may, confidently and ſafely, aſſert, that the condition of the women among many of the American tribes is as reſpectable and as important as it was among the Germans, in the days of Tacitus; or as it is among any other nations, with whom we are acquainted, in a ſimilar ſtage of improvement. "Their buſineſs, or employment, "ſays the ingenious Mr William Bartram," is chiefly in their houſes, except at thoſe ſeaſons when their crops of maize, &c. are growing, at which times they generally turn out with their huſbands and parents; but they are by no means compelled to do this, and one ſeldom ſees a third as many females as males at work, in their plantations." "You may depend on my aſſertion," ſays the ſame gentleman, who had ample opportunities of ſtudying the cuſtoms and manners of the ſouthern Indians, of whom he is ſpeaking, in this place) "that there are no people, any where, who love their women more than theſe Indians do, or men of better underſtanding in diſtinguiſhing the merits of the oppoſite ſex;—or men more faithful in rendering ſuitable compenſation. They are courteous and polite to their women,—gentle, tender and fondling, even to an appearance of effeminancy. An Indian man ſeldom attempts to uſe a woman, of any deſcription, with indelicacy, either of action, or of language.

S. penes B S. ton.

"In the hunting ſeaſons, that is, in Autumn, and in winter, when the men are generally out in the foreſts, the whole care of the houſe or family devolves on the women: at theſe times they are obliged to undergo a great deal of labour and fatigue, ſuch as cutting wood, &c. But this labour is, in part, alleviated by the aſſiſtance of the old men, who are paſt their hunting days, or who are, no longer, capable of ſerving in war." But nothing more clearly ſhows the importance and reſpectability of the women among the Indians than this circumſtance, that, among ſome of the tribes, they are permitted to preſide in the councils of their country: to this we may add, that ſeveral of the Florida nations have, at different times, been governed by the wiſdom, and the prudence of female caciques.

Polygamy is practiſed by ſome nations, but it is not general. In moſt, they content themſelves with one wife; but a divorce is admitted of in caſe of adultery. No nation of the Americans is without a regular marriage, in which there are many ceremonies; the principal of which is, the bride's preſenting the bridegroom with a plate of their corn. The women, though before incontinent, are remarkable for chaſtity after marriage.

38 Their ardent love of liberty.

Liberty, in its full extent, being the darling paſſion of the Indians, their education is directed in ſuch a manner as to cheriſh this diſpoſition to the utmoſt. Hence children are never upon any account chaſtiſed with blows, and they are ſeldom even reprimanded. Reaſon, they ſay, will guide their children when they come to the uſe of it, and before that time their faults cannot be very great: but blows might damp their free and martial ſpirit, by the habit of a ſlaviſh motive to action. When grown up, they experience nothing like command, dependence, or ſubordination; even ſtrong perſuaſion is induſtriouſly withheld by thoſe who have influence among them.—No man is held in great eſteem, unleſs he has increaſed the ſtrength of his country with a captive, or adorned his hut with a ſcalp of one of his enemies.

39 Crimes and puniſhments.

Controverſies among the Indians are few, and quickly decided. When any criminal matter is ſo flagrant as to become a national concern, it is brought under the juriſdiction of the great council; but in ordinary caſes, the crime is either revenged or compromiſed by the parties concerned. If a murder be committed, the family which has loſt a relation prepares to retaliate on that of the offender. They often kill the murderer; and when this happens, the kindred of the laſt perſon ſlain look upon themſelves to be as much injured, and to have the ſame right to vengeance, as the other party. In general, however, the offender abſents himſelf; the friends ſend compliments of condolence to thoſe of the perſon who has been murdered. The head of the family, at length, appears with a number of preſents, the delivery of which he accompanies with a formal ſpeech. The whole ends, as uſual, in mutual feaſtings, in ſongs, and in dances. If the murder is committed by one of the ſame family, or cabin, that cabin has the full right of judgment within itſelf, either to puniſh the guilty with death, or to pardon him, or to oblige him to give ſome recompence to the wife or children of the ſlain. Inſtances of ſuch a crime, however, very ſeldom happen; for their attachment to thoſe of the ſame family is remarkably ſtrong, and is ſaid to produce ſuch friendſhips as may vie with the moſt celebrated in fabulous antiquity.

40 Peculiar manners of different nations.

Such, in general, are the manners and cuſtoms of the Indian nations; but almoſt every tribe has ſomething peculiar to itſelf. Among the Hurons, and the Natchez, the dignity of the chief is ſaid to be hereditary, and the right of ſucceſſion in the female line. When this happens to be extinct, the moſt reſpectable matron of the tribe, we are informed, makes choice of whom ſhe pleaſes to ſucceed.

The Cheerake are governed by ſeveral ſachems, or chiefs, elected by the different villages; as are alſo the Creeks, and the Chactaws. The two latter puniſh adultery in a woman by cutting off her hair, which they will not ſuffer to grow till the corn is ripe, the next ſeaſon; but the Illinois, for the ſame crime, cut off the women's noſes and ears.

The Indians on the Lakes are formed into a ſort of empire; and the emperor is elected from the eldeſt tribe, which is that of the Ottowawas. This authority is very conſiderable. A few years ago, the perſon who held this rank formed a deſign of uniting all the Indian nations, under his ſovereignty; but he miſcarried in the bold attempt.

41 Longevity of the Indians.

In general, the American Indians live to a great age, although it is not eaſy to know from themſelves the exact number of their years. It was aſked of an Indian, who appeared to be extremely old, what age he was of? I am above twenty, was his reply. Upon putting the queſtion in a different form, by reminding him of certain circumſtances, in former times, my *machu*, ſaid he, ſpoke to me, when I was young, of the Incas; and he had ſeen theſe princes. According to this reply, there muſt have elapſed, from the date of his machu's (his grandfather's) remembrance to that time, a period of, at leaſt, 232 years. The man who made this reply, appeared to be 120 years of age: for, beſides the whiteneſs of his hair and beard, his body was almoſt bent to the ground; without, however, ſhowing any other marks of debility, or ſuffering. This happened in 1764. This longevity, attended in general with uninterrupted health, is thought, by ſome writers, to be the conſequence in part of their vacancy from all ſerious thought and employment, joined alſo with the robuſt texture and conformation of their bodily organs. If the Indians did not deſtroy one another, in their almoſt perpetual wars, and if their habits of intoxication were not ſo univerſal and incurable, they would be, of all the races of men who inhabit the globe, the moſt likely to extend, not only the bounds, but the enjoyments, of animal life to their utmoſt duratiom.

42 Other pictures of the Americans.

Let us now attend to other pictures which have been given of the aboriginal inhabitants of the New-World. The vices and defects of the American Indians have been, by ſeveral writers, moſt unaccountably aggravated, and every virtue and good quality denied them. Their cruelties have been already deſcribed, and accounted for. The following anecdote of an Algonquin woman we find adduced as a remarkable proof of their innate thirſt of blood.

43 Anecdote of an Algonquin woman.

That nation being at war with the Iroquois, ſhe happened to be taken priſoner, and was carried to one of the villages belonging to them. Here ſhe was ſtripped naked, and her hands and feet bound, with ropes, in one of their cabins. In this condition ſhe remained ten days, the ſavages ſleeping round her every night. The eleventh night, while they were aſleep, ſhe found means to diſengage one of her hands, with which ſhe immediately freed herſelf from the ropes, and went to the door. Though ſhe had now an opportunity of eſcaping unperceived, her revengeful temper could not let ſlip ſo favourable an opportunity of killing one of her enemies. The attempt was manifeſtly at the hazard of her own life; yet, ſnatching up a hatchet, ſhe killed the ſavage that lay next her: and, ſpringing out of the cabin, concealed herſelf in a hollow tree, which ſhe had obſerved the day before. The groans of the dying perſon ſoon alarmed the other ſavages, and the young ones immediately ſet out in purſuit of her. Perceiving, from her tree, that they all directed their courſe one way, and that no ſavage was near her, ſhe left her ſanctuary, and flying by an oppoſite direction, ran into a foreſt without being perceived. The ſecond day after this happened, her footſteps were diſcovered; and they purſued her with ſuch expedition, that the third day ſhe diſcovered her enemies at her heels. Upon this, ſhe threw herſelf into a pond of water; and diving among ſome weeds and bulruſhes, ſhe could juſt breath above water without being perceived. Her purſuers, after making the moſt diligent ſearch, were forced to return.—For 35 days this woman held on her courſe through woods and deſarts, without any other ſuſtenance than that which roots and wild berries afforded her. When ſhe came to the river St Lawrence, ſhe made, with her own hands, a kind of a wicker raft, on which ſhe croſſed it. As ſhe went by the French for Trois-Riviers, without well knowing where ſhe was, ſhe perceived a canoe full of ſavages; and fearing they might be Iroquois, ran again into the woods, where ſhe remained till ſunſet.—Continuing her courſe ſoon after, ſhe ſaw Trois-Riviers; and was then diſcovered by a party whom ſhe knew to be Hurons, a nation in alliance with the Algonquins. She then ſquatted down, behind a buſh, calling out to them that ſhe was not in a condition to be ſeen, becauſe ſhe was naked. They immediately threw her a blanket, and then conducted her to a fort, where ſhe recounted her ſtory.

44 Reproach ed with p ſilanimit

Perſonal courage has been denied them. In proof of their puſilanimity, the following incidents are quoted from Charlevoix by lord Kames, in his *Sketches of the Hiſtory of Man*: "The fort de Vercheres, in Canada, belonging to the French, was, in the year 1690, attacked by the Iroquois. They approached ſilently, preparing to ſcale the palaſade, when ſome muſket-ſhot made them retire. Advancing a ſecond time, they were again repulſed, wondering that they could diſcover none but a woman, who was ſeen every where. This was Madame de Vercheres, who appeared as reſolute as if ſupported by a numerous garriſon. The hopes of ſtorming a place without men to defend it, occaſioned reiterated attacks. After two days ſiege they retired, fearing to be intercepted in their retreat. Two years after, a party of the ſame nation appeared before the fort ſo unexpectedly, that a girl of fourteen, daughter of the proprietor, had but time to ſhut the gate. With the young woman there was not a ſoul but one raw ſoldier. She ſhowed herſelf, with her aſſiſtant, ſometimes in one place, and ſometimes in another; changing her dreſs frequently, in order to give ſome appearance of a garriſon; and always firing opportunely. The fainthearted Iroquois decamped without ſucceſs."

There is no inſtance, it is ſaid, either of a ſingle Indian facing an individual, of any other nation, in fair and open combat, or of their jointly venturing to try the fate of battle with an equal number of any foes. Even with the greateſt ſuperiority of numbers, they dare not meet an open attack. Yet, notwithſtanding this want of courage, they are ſtill formidable; nay, it has been known, that a ſmall party of them has routed a much ſuperior body of regular troops: but this can only happen when they have ſurpriſed them in the faſtneſſes of their foreſts, where the covert of the wood may conceal them until they take their aim with the utmoſt certainty. After one ſuch diſcharge they immediately merica.

retreat, without leaving the ſmalleſt trace of their route. It may eaſily be ſuppoſed, that an onſet of this kind muſt produce confuſion even among the ſteadieſt troops, when they can neither know the number of their enemies, nor perceive the place where they lie in ambuſh.

45
ccuſed of
rfidy.

Perfidy combined with cruelty has been alſo made a part of their character. Don Ulloa relates, That the Indians called *Natches*, in Louiſiana, laid a plot of maſſacring, in one night, every individual belonging to the French colony eſtabliſhed there. This plot they actually executed, notwithſtanding the ſeeming good underſtanding that ſubſiſted between them and theſe European neighbours. Such was the ſecrecy which they obſerved, that no perſon had the leaſt ſuſpicion of their deſign until the blow was ſtruck. One Frenchman alone eſcaped, by favour of the darkneſs, to relate the diſaſter of his countrymen. The compaſſion of a female Indian contributed alſo, in ſome meaſure, to his exemption from the general maſſacre. The tribe of Natches had invited the Indians of other countries, even to a conſiderable diſtance, to join in the ſame conſpiracy. The day, or rather the night, was fixed, on which they were to make an united attack on the French coloniſts. It was intimated by ſending a parcel of rods, more or leſs numerous according to the local diſtance of each tribe, with an injunction to abſtract one rod daily; the day on which the laſt fell to be taken away being that fixed for the execution of their plan. The women were partners of the bloody ſecret. The parcels of rods being thus diſtributed, that belonging to the tribe of Natches happened to remain in the cuſtody of a female. This woman, either moved by her own feelings of compaſſion, or by the commiſeration expreſſed by her female acquaintances, in the view of the propoſed ſcene of blood ſhed, abſtracted one day three or four of the rods, and thus anticipated the term of her tribe's proceeding to the execution of the general conſpiracy. The conſequence of this was, that the Natches were the only actors in this carnage; their diſtant aſſociates having ſtill ſeveral rods remaining at the time when the former made the attack. An opportunity was, thereby, given to the coloniſts, in thoſe quarters, to take meaſures for their defence, and for preventing a more extenſive execution of the deſign.

It was by conſpiracies ſimilar to this that the Indians of the province of Macás, in the kingdom of Quito, deſtroyed the opulent city of Logrogno, the colony of Guambaya, and its capital Sevilla del Oro; and that ſo completely, that it is no longer known in what place theſe ſettlements exiſted, or where that abundance of gold was found from which the laſt-mentioned city took the addition to its name. Similar ravages have been committed upon l'Imperial, in Chili, the colonies of the Miſſions of Chuncas, thoſe of Darien, in Tierra-Ferme, and many other places, which have afforded ſcenes of this barbarous ferocity. Theſe conſpiracies are always carried on in the ſame manner. The ſecret is inviolably kept, the actors aſſemble at the preciſe hour appointed, and every individual is animated with the ſame ſanguinary purpoſes. The males who fall into their hands are put to death, with every ſhocking circumſtance that can be ſuggeſted by a cool and determined cruelty. The females are carried off and preſerved, as monuments of their victory, to be employed as their occaſions require.

America.

Nor can this odious cruelty and treachery, it is ſaid, be juſtly aſcribed to their ſubjection to a foreign yoke, ſeeing the ſame character belongs equally to all the original inhabitants of this vaſt continent, even to thoſe who have preſerved their independence moſt completely. Certain it is, continues Ulloa, that theſe people, with the moſt limited capacities for every thing elſe, diſplay an aſtoniſhing degree of penetration and ſubtlety, with reſpect to every object that involves treachery, bloodſhed, and rapine. As to theſe, they ſeem to have been all educated at one ſchool; and a ſecret, referring to any ſuch plan, no conſideration on earth can extort from them.

46
Their underſtanding repreſented as weak.

Their underſtandings alſo have been repreſented as not leſs contemptible than their manners are groſs and brutal. Many nations, it has been ſaid, are neither capable of forming an arrangement for futurity, nor does their ſolicitude or foreſight extend ſo far. They ſet no value upon thoſe things of which they are not in ſome immediate want. In the evening, ſays father Labat, when a Carib is going to reſt, no conſideration will tempt him to ſell his hammock; but in the morning he will part with it for the ſlighteſt trifle. At the cloſe of winter, a North-American, mindful of what he has ſuffered from the cold, ſets himſelf with vigour to prepare materials for erecting a comfortable hut, to protect him againſt the inclemency of the ſucceeding ſeaſon: but as ſoon as the weather becomes mild, he abandons his work, and never thinks of it more till the return of the cold compels him to reſume it.—In ſhort, to be free from labour ſeems to be the utmoſt wiſh of an American. They will continue, whole days, ſtretched in their hammocks, or ſeated on the earth, without changing their poſture, raiſing their eyes, or uttering a ſingle word. They cannot compute the ſucceſſion of days, nor of weeks. The different aſpects of the moon alone engage their attention, as a meaſure of time. Of the year they have no other conception than what is ſuggeſted to them by the alternate heat of ſummer, and by the cold of winter; nor have they the leaſt idea of applying to this period the obvious computation of the months which it contains. When it is aſked of any old man, in Peru, even the moſt civilized, what age he is of? the only anſwer he can give is the number of caciques he has ſeen. It often happens, too, that they only recollect the moſt diſtant of theſe princes, in whoſe time certain circumſtances had happened peculiarly memorable, while of thoſe who lived in a more recent period they have loſt all remembrance.

47
Alleged indolence and ſtupidity.

The ſame groſs ſtupidity is alledged to be obſervable in thoſe Indians who have retained their original liberty. They are never known to fix the dates of any events in their minds, or to trace the ſucceſſion of circumſtances that have ariſen from ſuch events. Their imagination takes in only the *preſent*, and in that only what intimately concerns themſelves. Nor can diſcipline or inſtruction overcome this natural defect of apprehenſion. In fact, the ſubjected Indians in Peru, who have a continual intercourſe with the Spaniards, who are furniſhed with curates perpetually occupied in giving them leſſons of religion and morality, and who mix with all ranks of the civilized ſociety eſtabliſhed among them, are almoſt as ſtupid and barbarous as their countrymen who have had no ſuch advantages. The Peruvians, while they lived under the government of their Incas, preſerved the records of cerain remarkable events. They had alſo a kind of regular government deſcribed by the hiſtorians of the conqueſt of Peru. This government originated entirely from the attention and abilities of their princes, and from the regulations enacted by them for directing the conduct of their ſubjects. This ancient degree of civilization among them gives ground to preſume that their legiſlatures ſprung from ſome race more enlightened than the other tribes of Indians; a race, of which no individual ſeems to remain in the preſent times.

48
Their vanity and conceit.

Vanity and conceit are ſaid to be blended with their ignorance, and treachery. Notwithſtanding all they ſuffer from Europeans, they ſtill, it is ſaid, conſider themſelves as a race of men far ſuperior to their conquerors. This proud belief, ariſing from their perverted ideas of excellence, is univerſal over the whole known continent of America. They do not think it poſſible that any people can be ſo intelligent as themſelves. When they are detected in any of their plots, it is their common obſervation, that the Spaniards, or *Virochocas*, want to be as knowing as they are. Thoſe of Louiſiana and the countries adjacent, are equally vain of their ſuperior underſtanding, confounding that quality with the cunning which they themſelves conſtantly practiſe. The whole object of their tranſactions is to over-reach thoſe with whom they deal. Yet though faithleſs themſelves, they never forgive the breach of promiſe on the part of others. While the Europeans ſeek their amity by preſents, they give themſelves no concern to ſecure a reciprocal friendſhip. Hence, probably, ariſes their idea, that they muſt be a ſuperior race of men, in ability and intelligence, to thoſe who are at ſuch pains to court their alliance, and avert their enmity.

49
Their eloquence diſparaged.

Their natural eloquence has alſo been decried. The free tribes of ſavages who enter into conventions with the Europeans, it is obſerved, are accuſtomed to make long, pompous, and, according to their own notions, ſublime harangues, but without any method, or connection. The whole is a collection of disjointed metaphors and compariſons. The light, heat, and courſe of the ſun, form the principal topic of their diſcourſe; and theſe unintelligible reaſonings are always accompanied with violent and ridiculous geſtures. Numberleſs repetitions prolong the oration, which, if not interrupted, would laſt whole days: at the ſame time, they meditate very accurately, before hand, in order to avoid mentioning any thing but what they are deſirous to obtain. This pompous faculty of making ſpeeches is alſo one of the grounds on which they conceive themſelves to be ſuperior to the nations of Europe: they imagine that it is their eloquence that procures them the favours they aſk. The ſubjected Indians converſe preciſely in the ſame ſtyle. Prolix and tedious, they never know when to ſtop; ſo that, excepting by the difference in language, it would be impoſſible, in this reſpect, to diſtinguiſh a civilized Peruvian from an inhabitant of the moſt ſavage diſtricts to the northward.

50
All theſe views partial, and not free from miſrepreſentation.

But ſuch partial and detached views, as the above, were they even free from miſrepreſentation, are not the juſt ground upon which to form an eſtimate of their character. Their qualities, good and bad (for they certainly poſſeſs both), their way of life, the ſtate of ſociety among them, with all the circumſtances of their condition, ought to be conſidered *in connection*, and in regard to their mutual influence. Such a view has been given in the preceding part of this article: from which, it is hoped, their real character may be eaſily deduced.

Many of the diſagreeable traits exhibited in the anecdotes juſt quoted, are, indeed, extracted from Don Ulloa; an author of credit and reputation; but a Spaniard, and evidently biaſſed, in ſome degree, by a deſire to palliate the enormities of his countrymen in that quarter of the globe. And, with regard to the worſt and leaſt equivocal parts of the American character, cruelty and revenge; it may be fairly queſtioned, whether the inſtances of theſe, either in reſpect of their cauſe or their atrocity, be at all comparable to thoſe exhibited in European hiſtory, and ſtaining the annals of Chriſtendom:—to thoſe, for inſtance, of the Spaniards themſelves, at their firſt diſcovery of America; to thoſe indicated by the engines found on board their mighty Armada, in 1588; to thoſe which, in cold blood, were perpetrated by the Dutch at Amboyna; to the dragoonings of the French; to their religious maſſacres: or, even, to the *tender mercies* of the Inquiſition!

51
The phyſ
cal deſcri
tions of
Buffon a
de Pauw
refuted.

Still harſher, however, are the deſcriptions given by *Buffon* and *de Pauw*, of the natives of this whole continent, in which the moſt mortifying degeneracy of the human race, as well as of all the inferior animals, is aſſerted to be conſpicuous. Againſt theſe philoſophers, or rather theoriſts, however, the Americans have found an able advocate in the Abbé *Clavigero*; an hiſtorian, who, not only from his being a native of America, but alſo from his ſituation, and long reſidence in Mexico, has been enabled to obtain the beſt means of information, and who, though himſelf a ſubject of Spain, appears ſuperior to prejudice, and diſdains in his deſcription the gloſſes of policy.

Hiſt. of Mexico, v. II. p. 32

52
Stature,
ſhape, &

Concerning the ſtature of the Americans, M. de Pauw ſays, that although, in general, it is not equal to the ſtature of the Caſtilians, there is but little difference between them. But the Abbé Clavigero evinces, that the Indians who inhabit thoſe countries lying between 9 and 40 degrees of north latitude, which are the limits of the diſcoveries of the Spaniards, are more than five Pariſian feet in height, and that thoſe who do not reach that ſtature are as few in number amongſt the Indians as they are amongſt the Spaniards. It is beſides certain, that many of the American nations, ſuch as the *Apaches*, the *Hiaqueſe*, the *Pimeſe*, and *Cochimies*, are at leaſt as tall as the talleſt Europeans; and that, in all the vaſt extent of the New-World, no race of people has been found, except the Eſquimaux, in the north, and weſt, and the Yacana-cunnees, and Peſherais, &c. in the ſouth, ſo diminutive in ſtature as the Laplanders, the *Samojeds*, and Tartars, in the north of the Old-Continent. In this reſpect, therefore, the inhabitants of the two continents are upon an equality.

Of the ſhape and character of the Mexican Indians, the Abbé gives a moſt advantageous deſcription; which, he aſſerts, no one who reads it, in America, will contradict, unleſs he views them with the eye of a prejudiced mind. It is true, that Ulloa ſays, in ſpeaking of the Indians of Quito, he had obſerved that "imperfect people abounded among them; that they were either irregularly diminutive, or monſtrous in ſome other reſpect; that they became either inſenſible, dumb, or blind; or wanted ſome limb of their body." Having, therefore, made ſome inquiry reſpecting this ſingularity of the Quitans, the Abbé found, that ſuch defects were neither cauſed by what he calls bad humours, nor by the climate, but by the miſtaken and blind humanity of their parents, who, in order to free their children from the hardſhips and toils to which the healthy Indians are ſubjected by the Spaniards, fix ſome deformity or weakneſs upon them, that they may become uſeleſs: a circumſtance of miſery which does not happen in other countries of America, nor in thoſe places of the ſame kingdom of Quito, where the Indians are under no ſuch oppreſſion. M. de Pauw, and, in agreement with him, Dr Robertſon, ſays, that no deformed perſons are to be found among the ſavages of America; becauſe, like the ancient Lacedemonians, they put to death thoſe children which are born hunchbacked, blind, or defective, in any limb; but that in thoſe countries where they are formed into ſocieties, and where the vigilance of their rulers prevents the murder of ſuch infants, the number of their deformed individuals is greater than it is in any country of Europe. This would make an exceedingly good ſolution of the difficulty if it were true: but if, poſſibly, there has been in America a tribe of ſavages who have imitated the barbarous example of the celebrated Lacedemonians, it is certain that thoſe authors have no grounds to impute ſuch inhumanity to the reſt of the Americans: and it has not been the practice, at leaſt with the far greater part of thoſe nations, as may be demonſtrated from the atteſtations of authors who are the beſt acquainted with their cuſtoms.

53
Errors concerning their want of beard, &c.

No argument againſt the New-World can be drawn from the colour of the Americans; for their colour is leſs diſtant from the white of the Europeans than it is from the black of the Africans, and a great part of the Aſiatics. The hair of the Mexicans, and of the greater part of the Indians, is, as we have already ſaid, coarſe and thick; on their faces they appear to have little, and in general none on their arms and legs: but it is an error to ſay, as M. de Pauw does, that they are entirely deſtitute of hair in all the other parts of their body. This is one of the many paſſages in the *Philoſophical Reſearches*, at which the Mexicans, and all the other nations, muſt ſmile, to find an European philoſopher ſo eager to diveſt them of the dreſs they had from nature. Don Ulloa, indeed, in the deſcription which he gives of the Indians of Quito, ſays, that hair neither grows upon the men nor upon the women when they arrive at puberty, as it does on the reſt of mankind; but whatever ſingularity may attend the Quitans, or occaſion this circumſtance, there is no doubt that among the Americans in general, the period of puberty is accompanied with the ſame ſymptoms as it is among other nations of the world. In fact, with the North-Americans, it is diſgraceful to be hairy on the body. They ſay it likens them to hogs. They, therefore, pluck the hair as faſt as it appears. But the traders who marry their women, and prevail on them to diſcontinue this practice, ſay, that nature is the ſame with them as with the whites. As to the beards of the men, had Buffon, or de Pauw, known the pains and trouble it coſts them to pluck out by the roots the hair that grows on their faces, they would have ſeen that nature had not been deficient in that reſpect. Every nation has its cuſtoms. "I have ſeen an Indian beau, with a looking-glaſs in his hand (ſays Mr Jefferſon), examining his face, for hours together, and plucking out, by the roots, every hair he could diſcover, with a kind of tweezer made of a piece of fine braſs wire, that had been twiſted round a ſtick, and which he uſed with great dexterity."

54
Their form and aſpect contraſted with thoſe of ſome other nations.

The very aſpect of an Angolan, a Mandingan, or a Congan, would have ſhocked M. de Pauw, and made him recal the cenſure which he paſſes on the colour, the make, and hair of the Americans. What can be imagined more contrary to the idea *we* have of beauty, and the perfection of the human frame, than a man, whoſe ſkin is black as ink, whoſe head and face are covered with black wool, inſtead of hair, whoſe eyes are yellow and bloody, whoſe lips are thick and blackiſh, and whoſe noſe is flat? Such are the inhabitants of a very large portion of Africa, and of many iſlands of Aſia. What men can be more imperfect than thoſe who meaſure no more than four feet in ſtature, whoſe faces are long and flat, the noſe compreſſed, the irides yellowiſh black, the eye-lids turned back towards the temples, the cheeks extraordinarily elevated, their mouths monſtrouſly large, their lips thick and prominent, and the lower part of their viſages extremely narrow? Such, according to Count de Buffon, are the Laplanders, the Zemblans, the Borandines, the Samojeds, and the Tartars, in the Eaſt. What objects more deformed than men whoſe faces are too long and wrinkled even in their youth, their noſes thick and compreſſed, their eyes ſmall and ſunk, their cheeks very much raiſed, the upper jaw low, their teeth long and diſunited, eye-brows ſo thick that they ſhade their eyes, the eye-lids thick, ſome briſtles on their faces inſtead of beard, large thighs and ſmall legs? Such is the picture Count de Buffon gives of the Tartars; that is, of thoſe people who, as he ſays, inhabit a tract of land in Aſia 1200 leagues long and upwards, and more than 750 broad. Amongſt theſe, the Calmucks are the moſt remarkable for their deformity; which is ſo great, that, according to Tavernier, they are the moſt brutal men of all the univerſe. Their faces are ſo broad that there is a ſpace of five, or ſix, inches between their eyes, as Count de Buffon himſelf affirms. In Calicut, in Ceylon, and in other countries of India, there is, ſay Pyrard, and other writers, on thoſe regions, a race of men who have one, or both, of their legs as thick as the body of a man; and that this deformity among them is almoſt hereditary.

If we were, in like manner, to go through the nations of Aſia and Africa, we ſhould hardly find any extenſive country where the colour of men is not darker, where there are not ſtronger irregularities obſerved, and groſſer defects to be found in them, than even the penetrating eye of de Pauw could diſcover in the Americans. The colour of the latter is a good deal clearer than that of almoſt all the Africans and the inhabitants of ſouth Aſia. Even their alleged ſcantineſs of beard is common to the inhabitants of the Philippine-Iſlands, and of all the Indian-Archipelago, to the famous Chineſe, Japanneſe, Tartars, and many other nations of the Old-Continent. The imperfections of the Americans, however great they may be repreſented to be, are, certainly, not comparable with the defects of that immenſe people, whoſe character we have ſketched, and others whom we omit.

55 Their conſtitution and corporalabilities.

M. de Pauw repreſents the Americans to be a feeble and diſeaſed ſet of nations; and, in order to demonſtrate the weakneſs and diſorder of their phyſical conſtitution, adduces ſeveral proofs equally ridiculous and ill-founded, and which it will not be expected we ſhould enumerate. He alleges, among other particulars, that they were overcome in wreſtling by all the Europeans, and that they ſunk under a moderate burden; that by a computation made, 200,000 Americans were found to have periſhed, in one year, from carrying of baggage. With reſpect to the firſt point, the Abbé Clavigero obſerves, it would be neceſſary that the experiment of wreſtling was made between many individuals of each continent, and that the victory ſhould be atteſted by the Americans, as well as by the Europeans. It is not, however, meant to inſiſt, that the Americans are ſtronger than the Europeans. They may be leſs ſtrong, without the human ſpecies having degenerated in them. The Swiſs are ſtronger than the Italians; and ſtill we do not believe the Italians are degenerated, nor do we tax the climate of Italy. The inſtance of 200,000 Americans having died, in one year, under the weight of baggage, were it true, would not convince us ſo much of the weakneſs of the Americans, as of the inhumanity of the Europeans. In the ſame manner that theſe 200,000 Americans periſhed, 200,000 Pruſſians would alſo have periſhed, had they been obliged to make a journey of between 300 and 400 miles, with 100 pounds of burden upon their backs; if they had collars of iron about their necks, and were obliged to carry that load over rocks and mountains; if thoſe who became exhauſted with fatigue, or wounded their feet ſo as to impede their progreſs, had their heads cut off that they might not retard the pace of the reſt; and if they were not allowed but a ſmall morſel of bread to enable them to ſupport ſo ſevere a toil. Las Caſas, from whom M. de Pauw got the account of the 200,000 Americans, who died under the fatigue of carrrying baggage, relates, alſo, all the above mentioned circumſtances. If that author, therefore, is to be credited in the laſt, he is alſo to be credited in the firſt. But, a philoſopher who vaunts the phyſical and moral qualities of Europeans, over thoſe of the Americans, would have done better, we think, to have ſuppreſſed facts ſo opprobrious to the Europeans themſelves.

56 Their labour and induſtry.

Nothing, in fact, demonſtrates ſo clearly the robuſtneſs of the Americans as thoſe various, and laſting, fatigues in which they are continually engaged. M. de Pauw ſays, that when the New-World was diſcovered, nothing was to be ſeen but thick woods; that, at preſent, there are ſome lands cultivated, not by the Americans, however, but by the Africans, and Europeans; and that the ſoil in cultivation is to the ſoil which is uncultivated as 2000 to 2,000,000. Theſe three aſſertions the Abbé Clavigero demonſtrates to be preciſely ſo many errors. Since the conqueſt, the Americans alone have been the people who have ſupported all the fatigues of agriculture in all the vaſt countries of the continent of South-America, and in the greater part of thoſe of North-America ſubject to the crown of Spain. No European is ever to be ſeen employed in the labours of the field. The Moors who, in compariſon of the Americans, are very few in number in the kingdom of New-Spain, are charged with the culture of the ſugar-cane, and tobacco, and the making of ſugar; but the ſoil deſtined for the cultivation of thoſe plants is not, with reſpect to all the cultivated land of that country, in the proportion of one to two thouſand. The Americans are the people who labour on the ſoil. They are the tillers, the ſowers, the weeders, and the reapers of the wheat, of the maize, of the rice, of the beans, and other kinds of grain or pulſe, of the cocoa, of the vanilla, of the cotton, of the indigo, and all other plants uſeful to the ſuſtenance, the cloathing, and commerce of thoſe provinces; and without them ſo little can be done, that in the year 1762, the harveſt of wheat was abandoned, in many places, on account of a ſickneſs which prevailed, and prevented the Indians from reaping it. But this is not all; the Americans are they who cut and tranſport all the neceſſary timber from the woods; who cut, tranſport, and work the ſtones; who make lime, plaſter, and tiles; who conſtruct all the buildings of that kingdom, except a few places where none of them inhabit; who open and repair all the roads, who make the canals and ſluices, and clean the cities. They work in many mines of gold, of ſilver, of copper, &c.: they are the ſhepherds, herdſmen, weavers, potters, baſket-makers, bakers, couriers, day-labourers, &c.: in a word, they are the perſons who bear all the burden of public labours. Theſe, ſays our juſtly indignant author, are the employments of the weak, daſtardly, and uſeleſs Americans; while the vigorous M. de Pauw, and other indefatigable Europeans, are occupied in writing invectives againſt them.

57 Theſe a ſufficient proof of their healthineſs and ſtrength.

Theſe labours, in which the Indians are continually employed, certainly, atteſt their healthineſs and ſtrength; for if they are able to undergo ſuch fatigues, they cannot be diſeaſed, nor have an exhauſted ſtream of blood in their veins, as M. de Pauw inſinuates. In order to make it believed that their conſtitutions are vitiated, he copies whatever he finds written by hiſtorians of America, whether true or falſe, reſpecting the diſeaſes which reign in ſome particular countries of that great continent. It is not to be denied, that in ſome countries in the wide compaſs of America, men are expoſed, more than elſewhere, to the diſtempers which are occaſioned by the intemperature of the air, or the pernicious quality of the aliments; but it is certain, according to the aſſertion of many reſpectable authors acquainted with the New-World, that the American countries are, for the moſt part, healthy; and if the Americans were diſpoſed to retaliate on M. de Pauw, and other European authors, who write as he does, they would have abundant ſubject of materials to throw diſcredit on the clime of the Old-Continent, and the conſtitution of its inhabitants in the endemic diſtempers which prevail there.

Laſtly, the ſuppoſed feebleneſs and unſound bodily habit of the Americans do not correſpond with the length of their lives. Among thoſe Americans whoſe great fatigues and exceſſive toils do not anticipate their death, there are not a few who reach the age of 80, 90, and 100, or more, years, as formerly mentioned; and, what is more, without their being obſerved in them that decay which time commonly produces in the hair, in the teeth, in the ſkin, and in the muſcles of the human body. This phenomenon, ſo much admired by the Spaniards who reſide in Mexico, cannot be aſcribed to any other cauſe than the vigour of their conſtitutions, the temperance of their diet, and the ſalubrity of their clime. Hiſtorians, and other perſons who have ſojourned there for many years, report the ſame thing of other countries of the New-World.

58 Their mental qualities. As to the mental qualities of the Americans, M. de Pauw has not been able to diſcover any other characters than a memory ſo feeble, that to-day they do not remember what they did yeſterday; a capacity ſo blunt, that they are incapable of thinking or putting their ideas in order; a diſpoſition ſo cold, that they feel no excitement of love; a daſtardly ſpirit, and a genius that is torpid, and indolent. Many other Europeans, indeed, and what is ſtill more wonderful, many of thoſe children or deſcendants of Europeans who are born in America, think as M. de Pauw does; ſome from ignorance, ſome from want of reflection, and others from hereditary prejudice and prepoſſeſſion. But all this, and much more, would not be ſufficient to invalidate the teſtimonies of other Europeans, whoſe authority has a great deal more weight, both becauſe they were men of great judgment, learning, and knowledge, of theſe countries, and becauſe they give their teſtimony in favour of ſtrangers, againſt their own countrymen. In particular, Acoſta, whoſe *Natural* and *Moral Hiſtory* even de Pauw commends, as *an excellent work*, employs the whole ſixth book in demonſtrating the good ſenſe of the Americans, by an explanation of their ancient government, their laws, their hiſtories in paintings and knots, calenders, &c. M. de Pauw thinks the Americans are beſtial; Acoſta, on the other hand, reputes thoſe perſons weak and preſumptuous who think them ſo. M. de Pauw ſays, that the moſt acute Americans were inferior in induſtry and ſagacity to the rudeſt nations of the Old-Continent; Acoſta extols the civil government of the Mexicans above many republics of Europe. M. de Pauw finds, in the moral and political conduct of the Americans, nothing but barbarity, extravagance, and brutality; and Acoſta finds there, laws which are admirable and worthy of being preſerved for ever.

59 M. de Pauw's proofs of American cowardice. M. de Pauw denies them courage, and alleges the conqueſt of Mexico as a proof of their cowardice. "Cortes (ſays he), conquered the empire of Mexico with 450 vagabonds, and 15 horſes, badly armed; his miſerable artillery conſiſted of ſix falconets, which would not at the preſent day be capable of exciting the fears of a fortreſs defended by invalids. During his abſence, the capital was held in awe by the half of his troops. What men! what events!—It is confirmed by the depoſitions of all hiſtorians, that the Spaniards entered, the firſt time, into Mexico without making one ſingle diſcharge of their artillery. If the title of hero is applicable to him who has the diſgrace to occaſion the death of a great number of rational animals, Ferdinand Cortes might pretend to it; otherwiſe I do not ſee what true glory he has acquired by the overthrow of a tottering monarchy, which might have been deſtroyed, in the ſame manner, by any other aſſaſſin of our continent."

60 Refuted. Theſe paſſages indicate either M. de Pauw's ignorance of the hiſtory of the conqueſt of Mexico, or a wilful ſuppreſſion of what would openly contradict his ſyſtem; ſince all who have read that hiſtory know well, that the conqueſt of Mexico was not made with 450 men, but with more than 200,000. Cortes himſelf, to whom it was of more importance than to M. de Pauw to make his bravery conſpicuous, and his conqueſt appear glorious, confeſſes the exceſſive number of the allies who were under his command, at the ſiege of the capital, and combated with more fury againſt the Mexicans than the Spaniards themſelves. According to the account which Cortes gave to the emperor Charles V. the ſiege of Mexico began with 87 horſes, 848 Spaniſh infantry, armed with guns, croſs-bows, ſwords, and lances, and upwards of 75,000 allies, of Tlaſcala, Huexotzinco, Cholula, and Chalco, equipped with various ſorts of arms; with three large pieces of cannon of iron, 15 ſmall of copper, and 13 brigantines. In the courſe of the ſiege were aſſembled the numerous nations of the Otomies, the Cohuixcas, and Matlazincas, and the troops of the populous cities of the lakes; ſo that the army of the beſiegers not only exceeded 200,000, but amounted to 400,000, according to the letter from Cortes; and beſides theſe, 3000 boats and canoes came to their aſſiſtance. Did it betray cowardice to have ſuſtained, for full 75 days, the ſiege of an open city, engaging, daily, with an army ſo large, and in part provided with arms ſo ſuperior, and at the ſame time having to withſtand the ravages of famine? Can they merit the charge of cowardice, who, after having loſt ſeven of the eight parts of their city, and about 50,000 citizens, part cut off by the ſword, part by famine and ſickneſs, continued to defend themſelves until they were furiouſly aſſaulted in the laſt hold which was left them? See the article Mexico.

61 Remarkable instance of calumny in M. de Pauw. According to M. de Pauw, "the Americans at firſt "were not believed to be men, but rather ſatyrs, or "large apes, which might be murdered, without re"morſe, or reproach. At laſt, in order to add inſult "to the oppreſſion of thoſe times, a pope made an ori"ginal bull, in which he declared, that being deſirous "of founding biſhoprics in the richeſt countries of A"merica, it pleaſed him and the Holy-Spirit, to ac"knowledge the Americans to be true men: in ſo "far, that without this deciſion of an Italian, the in"habitants of the New-World would have appeared, "even at this day, to the eyes of the faithful, a race "of equivocal men. There is no example of ſuch a "deciſion ſince this globe has been inhabited by men "and apes." Upon this paſſage the Abbé Clavigero animadverts, as being a ſingular inſtance of calumny and miſrepreſentation; and gives the following hiſtory of the deciſion alluded to.

62 Occaſion of the famous bull of Pope Paul III. "Some of the firſt Europeans who eſtabliſhed themſelves in America, not leſs powerful than avaricious, deſirous of enriching themſelves to the detriment of the Americans, kept them continually employed, and made uſe of them as ſlaves; and, in order to avoid the reproaches, which were made them, by the biſhops and miſſionaries, who inculcated humanity, and the giving liberty to thoſe people to get themſelves inſtructed in religion, that they might do their duties towards the church, and their families, alleged, that the Indians were by nature ſlaves and incapable of being inſtructed; and many other falſehoods of which the Chronicler Herrera makes mention againſt them. Thoſe zealous eccleſiaſtics being unable, either by their authority, or preaching, to free thoſe unhappy converts from the tyranny of ſuch miſers, had recourſe to the Catholic kings, and,

at laſt, obtained from their juſtice and clemency, thoſe laws, as favourable to the Americans as honourable to the court of Spain, that compoſe the Indian code, which were chiefly due to the indefatigable zeal of the biſhop de las Caſas. On another ſide, Garces, biſhop of Tlaſcala, knowing that thoſe Spaniards bore, notwithſtanding their perverſity, a great reſpect to the deciſion of the vicar of Jeſus Chriſt, made application, in the year 1586, to pope Paul III. by that famous letter, of which we have made mention; repreſenting to him the evils which the Indians ſuffered from the wicked Chriſtians, and praying him to interpoſe his authority in their behalf. The pope, moved by ſuch heavy remonſtrances, diſpatched, the next year, the original bull, a faithful copy of which we have here ſubjoined (A), which was not made, as is manifeſt, to declare the Americans true men; for ſuch a piece of weakneſs was very diſtant from that, or any other pope: but ſolely to ſupport the natural rights of the Americans, againſt the attempts of their oppreſſors, and to condemn the injuſtice and inhumanity of thoſe, who, under the pretence of ſuppoſing thoſe people idolatrous, or incapable of being inſtructed, took from them their property and their liberty, and treated them as ſlaves and beaſts."

63
Repreſentation of Columbus.

But, if, at firſt, the Americans were eſteemed ſatyrs, nobody can better prove it than Chriſtopher Columbus, their diſcoverer. Let us hear, therefore, how that celebrated admiral ſpeaks, in his account to Ferdinand and Iſabella, of the firſt ſatyrs he ſaw in the iſland of Haiti, or Hiſpaniola. "I ſwear," he ſays, "to your majeſties, that there is not a better people in the world than theſe, more affectionate, affable, or mild. They love their neighbours as themſelves; their language is the ſweeteſt, the ſofteſt, and the moſt chearful; for they always ſpeak ſmiling; and although they go naked, let your majeſties believe me, their cuſtoms are very becoming; and their king, who is ſerved with great majeſty, has ſuch engaging manners, that it gives great pleaſure to ſee him, and alſo to conſider the great retentive faculty of that people, and their deſire of knowledge, which incites them to aſk the cauſes and the effects of things."

64
Concluſions concerning the capacities of the Americans.

"We have had intimate commerce with the Americans (continues the Abbé); have lived, for ſome years, in a ſeminary deſtined for their inſtruction; ſaw the erection and progreſs of the royal college of Gradaloupe founded, in Mexico, by a Mexican Jeſuit, for the education of Indian children; had, afterwards, ſome Indians among our pupils; had particular knowledge of many American rectors, many nobles, and numerous artiſts; attentively, obſerved their character, their genius, their diſpoſition, and manner of thinking; and have examined, beſides, with the utmoſt diligence, their ancient hiſtory, their religion, their government, their laws, and their cuſtoms. After ſuch long experience and ſtudy of them, from which we imagine ourſelves enabled to decide, without danger of erring, we declare to M. de Pauw, and to all Europe, that the mental qualities of the Americans are not in the leaſt inferior to thoſe of the Europeans; that they are capable of all, even the moſt abſtract, ſciences; and that if equal care was taken of their education, if they were brought up from childhood in ſeminaries, under good maſters, were protected and ſtimulated by rewards, we ſhould ſee riſe among the Americans, philoſophers, mathematicians, and divines, who would rival the firſt in Europe."

65
Their ingenuity, &c. aſſerted

But, although we ſhould ſuppoſe, that, in the torrid climates of the New-World, as well as in thoſe of the Old, eſpecially under the additional depreſſion of ſlavery, there was an inferiority of the mental powers; the Chileſe, and the North-Americans, have diſcovered higher rudiments of human excellence and ingenuity than have, perhaps, ever been known among tribes in a ſimilar ſtate of ſociety, in any part of the world.

M. de Pauw affirms, that the Americans were unacquainted with the uſe of money, and quotes the following well-known paſſage from Monteſquieu: "Imagine to yourſelf that, by ſome accident, you are placed in an unknown country; if you find money there, do not doubt that you are arrived among a poliſhed people." But, if by money we are to underſtand a piece of metal with the ſtamp of the prince, or of the public, the want of it in a nation is no token of barbarity. The Athenians employed oxen for money, as the Romans did ſheep. The Romans had no coined money till the time of

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(A) Paulus papa III. univerſis Chriſti Fidelibus preſentes Literas inſpecturis Salutem & Apoſtolicam Benedictionem—"Veritas ipſa, quæ nec falli, nec fallere poteſt, cum Prædicatores Fidei ad officium prædicationis deſtinaret, dixiſſe dignoſcitur: *Euntes docete omnes gentes:* omnes, dixit, abſque omni delectu, cum omnes Fidei diſciplina capaces exiſtant. Quod videns & invidens ipſius humani generis æmulus, qui bonis operibus, ut pereant, ſemper adverſatur, modum excogitavit hactenus inauditum, quo impediret, ne Verbum Dei Gentibus, ut ſalvæ fierent, prædicaretur: ut quoſdam ſuos ſatellites commovit, qui ſuam cupiditatem adimplere cupientes. Occidentales & Meridionales Indos, & alias Gentes, quæ temporibus iſtis ad noſtram notitiam pervenerunt, ſub prætextu quod Fidei Catholicæ expertes exiſtant, uti bruta animalia, ad noſtra obſequia redigendos eſſe, paſſim aſſerere præſumant, & eos in ſervitutem redigunt tantis afflictionibus illos urgentes, quantis vix bruta animalia illis ſervientia urgeant. Nos igitur, qui ejuſdem Domini noſtri vices, licet indigni, gerimus in terris, & Oves gregis ſui nobis commiſſas, quæ extra ejus Ovile ſunt, ad ipſum Ovile toto nixu exquirimus, attendentes Indos ipſos, utpote veros homines, non ſolum Chriſtianæ Fidei capaces exiſtere, ſed, ut nobis innotuit, ad Fidem ipſam promptiſſime currere, ac volentes ſuper his congruis remediis providere, prædictos Indos & omnes alias gentes ad notitiam Chriſtianorum in poſterum deventuras, licet extra fidem Chriſti exiſtant, ſua libertate & dominio hujuſmodi uti, & potiri, & gaudere libere, & licete poſſe, nec in ſervitutem redigi debere, ac quicquid ſecus fieri contigerit irritum & inane, ipſoſque Indos, & alias Gentes Verbi Dei prædicatione, & exemplo bonæ vitæ ad dictam Fidem Chriſti invitandos fore. Auctoritate Apoſtolica per præſentes literas decernimus, & declaramus, non obſtantibus prœmiſſis, cæteriſque contrariis quibuſcunque." Datum Romæ anno 1537. IV. Non. Iun. Pontificatus noſtri anno III. Quæſta, è non altra è quella famoſa bolla, per la quale s' è fatto un ſi grande ſchiamazzo.

of Servius Tullius, nor had the Perſians until the reign of Darius Hyſtaſpes. But, if by money is underſtood a ſign repreſenting the value of merchandiſe, the Mexicans, and other nations of Anahuac, employed money in their commerce. The cacao, of which they made conſtant uſe in the market to purchaſe whatever they wanted, was employed for this purpoſe, as ſalt is in Abyſſinia.

It has been affirmed, that ſtone bridges were unknown in America, when it was firſt diſcovered; and that the natives did not know how to form arches. But, theſe aſſertions are erroneous. The remains of the ancient palaces of Tezcuco, and, ſtill more, their vapour baths, ſhow the ancient uſe of arches and of vaults among the Mexicans. But the ignorance of this art would have been no proof of barbarity. Neither the Egyptians nor Babylonians underſtood the conſtruction of arches.

M. de Pauw affirms, that the palace of Montezuma was nothing elſe than a *hut*. But, it is certain, from the affirmation of all the hiſtorians of Mexico, that the army under Cortes, conſiſting of 6,400 men, were all lodged in the palace; and there remained ſtill ſufficient room for Montezuma and his attendants.

66
Tokens of ſcience.

The advances which the Mexicans had made in the noble ſcience of aſtronomy, is, perhaps, the moſt ſurpriſing proof of their attention and ſagacity: for it appears, from Abbé Clavigero's *Hiſtory*, that they not only counted 365 days to the year, but alſo knew of the exceſs of about ſix hours in the ſolar over the civil year, and remedied the difference, by means of intercalary days. See ASTRONOMY, nº 5.

67
Specimen of their morality.

Of American morality, the following exhortation of a Mexican to his ſon may ſerve as a ſpecimen. "My ſon, who art come into the light from the womb of thy mother like a chicken from the egg, and, like it, art preparing to fly through the world, we know not how long Heaven will grant to us the enjoyment of that precious gem which we poſſeſs in thee; but however ſhort the period, endeavour to live exactly, praying God continually to aſſiſt thee. He created thee: thou art his property. He is thy father, and loves thee ſtill more than I do: repoſe in him thy thoughts, and day and night direct thy ſighs to him. Reverence and ſalute thy elders, and hold no one in contempt. To the poor and diſtreſſed be not dumb, but rather uſe words of comfort. Honour all perſons, particularly thy parents, to whom thou oweſt obedience, reſpect, and ſervice. Guard againſt imitating the example of thoſe wicked ſons, who, like brutes that are deprived of reaſon, neither reverence their parents, liſten to their inſtruction, nor ſubmit to their correction; becauſe whoever follows their ſteps will have an unhappy end, will die in a deſperate or ſudden manner, or will be killed, and devoured, by wild beaſts.

"Mock not, my ſon, the aged, or the imperfect. Scorn not him whom you ſee fall into ſome folly, or tranſgreſſion, nor make him reproaches; but reſtrain thyſelf, and beware leſt thou fall into the ſame error which offends thee in another. Go not where thou art not called, nor interfere in that which does not concern thee. Endeavour to manifeſt thy good breeding, in all thy words, and actions. In converſation, do not lay thy hands upon another, nor ſpeak too much, nor interrupt or diſturb another's diſcourſe. When any one diſcourſes with thee, hear him, attentively, and hold thyſelf in an eaſy attitude, neither playing with thy feet, nor putting thy mantle to thy mouth, nor ſpitting too often, nor looking about you here and there, nor riſing up frequently if thou art ſitting; for ſuch actions are indications of levity, and low-breeding."—The father proceeds to mention ſeveral particular vices which are to be avoided, and concludes—"Steal not, nor give thyſelf to gaming; otherwiſe thou wilt be a diſgrace to thy parents, whom thou oughteſt rather to honour for the education they have given thee. If thou wilt be virtuous, thy example will put the wicked to ſhame. No more my ſon; enough hath been ſaid in diſcharge of the duties of a father. With theſe counſels I wiſh to fortify thy mind. Refuſe them not, nor act in contradiction to them; for on them thy life, and all thy happineſs, depend."

68
Notions of M. de Buffon concerning the degeneracy of animal nature in America.

As ranging on the ſame ſide with the Abbè Clavigero, our countryman Mr Jefferſon deſerves particular attention. This gentleman, in his *Notes on the State of Virginia*, &c. has taken occaſion to combat the opinions of Buffon; and ſeems, in many inſtances, to have fully refuted them, both by argument and by facts. The French philoſopher aſſerts, "That living nature is leſs active, leſs energetic, in the New-World than in the Old." He affirms, 1. That the animals common to both continents are ſmaller in America. 2. That thoſe peculiar to the New are on an inferior ſcale. 3. That thoſe which have been domeſticated in both have degenerated in America; and, 4. That it exhibits fewer ſpecies of living creatures. The cauſe of this he aſcribes to the diminution of heat in America, and to the prevalence of humidity from the extenſion of its lakes and waters over a prodigious ſurface. In other words, he affirms that *heat* is friendly, and *moiſture* adverſe, to the production and developement of the larger quadrupeds.

69
The hypotheſis that moiſture is unfriendly to animal growth, conſidered.

The hypotheſis that moiſture is unfriendly to animal growth, Mr Jefferſon ſhows to be contradicted by obſervation, and by experience. It is by the aſſiſtance of heat and moiſture that vegetables are elaborated from the elements. Accordingly, we find that the more humid climates produce plants in greater profuſion than the dry. Vegetables are, immediately, or remotely, the food of every animal; and, from the uniform operation of nature's laws, we diſcern, that, in proportion to the quantity of food, animals are not only multiplied in their numbers, but improved in their ſize. Of this laſt opinion is the Count de Buffon himſelf, in another part of his work: "En general, il paroit que les pays un peu *froids* conviennent mieux à nos bœufs que les pays chauds, et qu'ils ſont d'autant plus gros et plus grands que le climat eſt plus *humide* et plus abondans en paturages. Les bœufs de Danemarck, de la Podolie, de l'Ukraine, et de la Tartarie qu'habitent les Calmouques, ſont les plus grands de tous."

70
The contrary maintained by Mr Jefferſon.

Here, then, a race of animals, and one of the largeſt too, has been increaſed in its dimenſions by cold and moiſture, in direct oppoſition to the hypotheſis, which ſuppoſes that theſe two circumſtances diminiſh animal bulk, and that it is their contraries, heat, and dryneſs, which enlarge it. But, to try the queſtion on more general ground, let us take two portions of the earth, Europe and America for inſtance, ſufficiently extenſive to give operation to general cauſes: let us conſider the circumſtances peculiar to each, and obſerve their effects on animal nature. America, running through the torrid, as well as temperate, zone, has more heat collectively taken, than Europe. But Europe, according to our hypotheſis, is the drieſt. They are equally adapted, then, to animal productions; each being endowed with one of thoſe cauſes which befriend animal growth, and with one which oppoſes it. Let us, then, take a comparative view of the quadrupeds of Europe and of America, preſenting them to the eye in three different tables; in one of which ſhall be enumerated thoſe found in both countries; in a ſecond, thoſe found in one only; in a third, thoſe which have been domeſticated in both. To facilitate the compariſon, let thoſe of each table be arranged in gradation, according to their ſizes, from the greateſt to the ſmalleſt, ſo far as their ſizes can be conjectured. The weights of the large animal ſhall be expreſſed in the Engliſh averdupoiſe pound and its decimals; thoſe of the ſmaller in the ounce and its decimals. Thoſe which are marked thus *, are actual weights of particular ſubjects, deemed among the largeſt of their ſpecies. Thoſe marked thus †, are furniſhed by judicious perſons, well acquainted with the ſpecies, and ſaying, from conjecture only, what the largeſt individual they had ſeen would probably have weighed. The other weights are taken from Meſſrs Buffon and D'Aubenton, and are of ſuch ſubjects as came caſually to their hands for diſſection.

“ A Comparative view of the Quadrupeds of Europe and of America.

TABLE I. *Aboriginals of both.*	Europe.	America.
	℔.	℔.
Mammouth (B)		
Buffalo. Biſon		*1800
White-bear. Ours blanc		
Carribou. Renne		
Bear. Ours	153.7	*410
Elk. Elan. Orignal, palmated		
Red-deer. Cerf	288.8	*273
Fallow-deer. Daim	167.8	
Wolf. Loup	69.8	
Roe. Chevreuil	56.7	
Glutton. Glouton. Carcajou		
Wild-cat. Chat ſauvage		†30
Lynx. Loup cervier	25.	
Beaver. Caſtor	18.5	*45
Badger. Blaireau	13.6	
Red-fox. Renard	13.5	
Grey-fox. Iſatis		
Otter. Loutre	8.9	†12
Monax. Marmotte	6.5	
Viſon. Fouine	2.8	
Hedgehog. Heriſſon	2.2	
Martin. Marte	1.9	†6
	oz.	
Water-rat. Rat d'eau	7.5	
Weſel. Belette	2.2	oz.
Flying-ſquirrel. Polatouche	2.2	†4
Shrew-mouſe. Muſaraigne	1.	

TABLE II. *Aboriginals of one only.*

EUROPE.		AMERICA.	
	℔.		℔.
Sanglier. Wild boar	280.	Tapir	534.
Mouflon. Wild ſheep	56.	Elk, round horned	†450.
Bouquetin. Wild goat		Puma	
Lievre. Hare	7.6	Jaguar	218.
Lapin. Rabbit	3.4	Cabiai	109.
Putois. Polecat	3.3	Tamanoir	109.
Genette	3.1	Tamandua	65.4
Deſman. Muſkrat	oz.	Cougar of N. Amer.	75.
Ecureuil. Squirrel	12.	Cougar of S. Amer.	59.4
Hermine. Ermin	8.2	Ocelot	
Rat. Rat	7.5	Pecari	46.3
Loirs	3.1	Jaguaret	43.6
Lerot. Dormouſe	1.8	Alco	
Taupe. Mole	1.2	Lama	
Hamſter	.9	Paco	
Ziſel		Paca	32.7
Leming		Serval	
Souris. Mouſe	.6	Sloth. Unau	27¼
		Saricovienne	
		Kincajou	
		Tatou Kabaſſou	21.8
		Urſon. Urchin	
		Racoon. Raton	16.5
		Coati	
		Coendou	16.3
		Sloth. Aï	13.
		Sapajou Ouarini	
		Sapajou Coaita	9.8
		Tatou Encubert	
		Tatou Apar	
		Tatou Cachica	7.
		Little Coendou	6.5
		Opoſſum. Sarigue	
		Tapeti	
		Margay	
		Crabier	
		Agouti	4.2
		Sapajou Saï	3.5
		Tatou Cirquinçon	
		Tatou Tatouate	3.3
		Mouffette Squaſh	
		Mouffette Chinche	
		Mouffette Conepate-Scunk	
		Mouffette. Zorilla	
		Whabus. Hare. Rabbit	
		Aperea	
		Akouchi	
		Ondatra. Muſkrat	
		Pilori	
		Great grey-ſquirrel	†2.7
		Fox ſquirrel, of Virginia	†2.625
		Surikate	2.
		Mink	†2.
		Sapajou. Sajou	1.8

(B) The bones of the Mammouth, or, as it has been called, by Dr Hunter, and by other writers, *Pſeudo-Elephant*, appear to be nearly of the ſame ſize, and weight, whether they are found in Europe, in Aſia, or in America. In theſe three portions of the earth, the animal, to which theſe exuviæ belonged, was, no doubt, *ſpecifically* the ſame. See the article MAMMOUTH.

Table II. continued.

EUROPE.	AMERICA.	
		℔.
	Indian pig. Cochon d'Inde	1.6
	Sapajou. Saïmiri	1.5
	Phalanger	
	Coquallin	
	Leſſer grey ſquirrel†	1.5
	Black ſquirrel	1.5
	Red ſquirrel	10. oz.
	Sagoin Saki	
	Sagoin Pinche	
	Sagoin Tamarin	oz.
	Sagoin Ouiſtiti	4.4
	Sagoin Marikine	
	Sagoin Mico	
	Cayopollin	
	Fourmillier	
	Marmoſe	
	Sarigue of Cayenne	
	Tucan	
	Red mole	oz.
	Ground ſquirrel	4.

TABLE III. *Domeſticated in both.*

	Europe.	America.
	℔.	℔.
Cow	763	*2500
Horſe		*1366
Aſs		
Hog		*1200
Sheep		*125
Goat		*80
Dog	67.6	
Cat	7.	

71 Reſult of the firſt table.

“ The reſult of this view is, that of 26 quadrupeds common to both countries, ſeven are ſaid to be larger in America, ſeven of equal ſize, and 12 not ſufficiently examined. So that the firſt table impeaches the firſt member of the aſſertion, that of the animals common to both countries the American are ſmalleſt, “ Et cela ſans aucune exception.” It ſhows it not juſt, in all the latitude in which its author has advanced it, and probably not to ſuch a degree as to found a diſtinction between the two countries.

72 Explanation and reſult of the ſecond table.

“ Proceeding to the ſecond table, which arranges the animals found in one of the two countries only, M. de Buffon obſerves, that the tapir, the elephant of America, is but of the ſize of a ſmall cow.” To preſerve the compariſon, Mr Jefferſon ſtates the wild boar, the elephant of Europe, as little more than half that ſize. He has made an elk, with round or cylindrical horns, an animal of America, and peculiar to it; becauſe he has ſeen many of them himſelf, and more of their horns; and becauſe, from the beſt information, it is certain that, in Virginia, this kind of elk has abounded, much, and ſtill exiſts, in ſmaller numbers. He makes the American hare, or rabbit, peculiar, becauſe he believes it to be different from both the European animals of thoſe denominations, and calls it, therefore, by its Algonquin name, *Whabus*, to keep it diſtinct from theſe. Kalm is of the ſame opinion. The ſquirrels are denominated from a knowledge derived from daily ſight of them, becauſe with that the European appellations and deſcriptions ſeem irreconcileable. Theſe are the only inſtances in which Mr Jefferſon departs from the authority of M. de Buffon, in the conſtruction of this table; whom he takes for his ground-work, becauſe he thinks him the beſt informed of any naturaliſt who has ever written. The reſult is, that there are 18 quadrupeds peculiar to Europe; more than four times as many, to wit 74, peculiar to America; that the firſt of theſe 74, the tapir, the largeſt of the animals peculiar to America, weighs more than the whole column of Europeans; and conſequently this ſecond table diſproves the ſecond member of the aſſertion, that the animals peculiar to the New-World are on a ſmaller ſcale, ſo far as that aſſertion relied on European animals for ſupport: and it is in full oppoſition to the theory which makes the animal volume to depend on the circumſtances of heat and moiſture.

73 Of the third table.

The third table comprehends thoſe quadrupeds only which are domeſtic in both countries. That ſome of theſe, in ſome parts of America, have become leſs than their original ſtock, is doubtleſs true; and the reaſon is very obvious. In a thinly-peopled country, the ſpontaneous productions of the foreſts and waſte fields are ſufficient to ſupport indifferently the domeſtic animals of the farmer, with a very little aid from him in the ſevereſt and ſcarceſt ſeaſon. He, therefore, finds it more convenient to receive them from the hand of nature in that indifferent ſtate, than to keep up their ſize by a care and nouriſhment which would coſt him much labour. If, on this low fare, theſe animals dwindle, it is no more than they do in thoſe parts of Europe where the poverty of the ſoil, or poverty of the owner, reduces them to the ſame ſcanty ſubſiſtence. It is the uniform effect of one and the ſame cauſe, whether acting on this or that ſide of the globe. It would be erring therefore againſt that principle of philoſophy, which teaches us to aſcribe like effects to like cauſes, ſhould we impute this diminution of ſize in America to any imbecility or want of uniformity in the operations of nature. It may be affirmed, with truth, that in thoſe countries, and with thoſe individuals, of America, where neceſſity or curioſity has produced equal attention as in Europe to the nouriſhment of animals, the horſes, cattle, ſheep, and hogs of the one continent are as large as thoſe of the other. There are particular inſtances, well atteſted, where individuals of America have imported good breeders from England, and have improved their ſize by care, in the courſe of ſome years”. And the weights actually known and ſtated in the third table, will ſuffice to ſhow, that we may conclude, on probable grounds, that, with equal food and care, the climate of America will preſerve the races of domeſtic animals as large as the European ſtock from which they are derived; and, conſequently, that the domeſtic animals are ſubject to degeneration from the climate of America, is as probably wrong as the firſt and ſecond are certainly ſo.

That the laſt part of it is erroneous, which affirms, that the ſpecies of American quadrupeds are comparatively few, is evident from the tables taken altogether; to which may be added the proofs adduced by the Abbé Clavigero. According to Buffon's lateſt calculation, in his *Epoques de la Nature*, there are 300 ſpecies of quadrupeds; and America, though it does not make more than a third part of the globe, contains, according to Clavigero, almoſt one half of the different ſpecies of theſe animals.

74
The human inhabitants comprehended in the ſame hypotheſis of degeneracy.

Of the human inhabitants of America, to whom the ſame hypotheſis of degeneracy is extended, M. Buffon gives the following deſcription: "Though the American ſavage be nearly of the ſame ſtature with men in poliſhed ſocieties; yet this is not a ſufficient exception to the general contraction of animated Nature throughout the whole continent. In the ſavage, the organs of generation are ſmall and feeble. He has no hair, no beard, no ardour for the female. Though nimbler than the European, becauſe more accuſtomed to running, his ſtrength is not ſo great. His ſenſations are leſs acute; and yet he is more timid and cowardly. He has no vivacity, no activity of mind. The activity of his body is not ſo much an exerciſe or ſpontaneous motion, as a neceſſary action produced by want. Deſtroy his appetite for victuals and drink, and you will, at once, annihilate the active principle of all his movements: he remains in ſtupid repoſe, on his limbs, or couch, for whole days. It is eaſy to diſcover the cauſe of the ſcattered life of ſavages, and of their eſtrangement from ſociety. They have been refuſed the moſt precious ſpark of Nature's fire: they have no ardour for women, and of courſe, no love to mankind. Unacquainted with the moſt lively and the moſt tender of all attachments, their other ſenſations of this nature are cold and languid. Their love to parents and children is extremley weak. The bonds of the moſt intimate of all ſocieties, that of the ſame family, are feeble; and one family has no attachment to another. Hence no union, no republic, no ſocial ſtate can take place among them. The phyſical cauſe of love gives riſe to the morality of their manners. Their heart is frozen, their ſociety cold, and their empire cruel. They regard their families as ſervants deſtined to labour, or as beaſts of burden, whom they load unmercifully with the produce of their hunting, and oblige, without pity or gratitude, to perform labours which often exceed their ſtrength. They have few children, and pay little attention to them. Every thing muſt be referred to the firſt cauſe; they are indifferent becauſe they are weak; and this indifference to the ſex is the original ſtain which diſgraces Nature; prevents her from expanding, and by deſtroying the germs of life, cuts the root of ſociety. Hence, man makes no exception to what has been advanced. Nature, by denying him the faculty of love, has abuſed and contracted him more than any other animal."

75
Obſervations by Mr Jefferſon.

An humiliating picture, indeed! but than which, Mr Jefferſon aſſures us, never was one more unlike the original. M. Buffon grants, that their ſtature is the ſame as that of the men of Europe, and he might have admitted, that the Iroquois were larger, and the Lenopi, or Delawares, taller, than people in Europe generally are. But, he ſays, their organs of generation are ſmaller and weaker than thoſe of Europeans: which is not *known*, at leaſt, to be a fact. And as to their want of beard, this error has been already noticed (n° 53. *ſupra*).

76
Seeming coldneſs of the Americans to the ſex accounted for.

"They have no ardour for their females."—It is true, they do not indulge thoſe exceſſes, nor diſcover that fondneſs, which are cuſtomary in Europe; but this is not owing to a defect in nature, but to manners. The ſoul of the Indian is wholly bent upon war. This is what procures him glory among the men, and makes him the admiration of the women. To this he is educated, from his earlieſt youth. When he purſues game with ardour, when he bears the fatigues of the chace, when he ſuſtains and ſuffers patiently hunger and cold; it is not ſo much for the ſake of the game he purſues, as to convince his parents and the council of the nation, that he is fit to be enrolled in the number of the warriors. The ſongs of the women, the dance of the warriors, the ſage counſel of the chiefs, the tales of the old, the triumphal entry of the warriors returning, with ſucceſs, from battle, and the reſpect paid to thoſe who diſtinguiſh themſelves in battle, and in ſubduing their enemies; in ſhort, every thing he ſees or hears tends to inſpire the Indian with an ardent deſire for military fame. If a young man were to diſcover a fondneſs for women before he has been to war, he would become the contempt of the men, and the ſcorn and ridicule of the women; or were he to indulge himſelf with a captive taken in war, and much more were he to offer violence in order to gratify his luſt, he would incur indelible diſgrace. The ſeeming frigidity of the American, therefore, is the effect of manners, and not a defect of nature. He is neither more defective in ardour, nor impotent with the female, than a White man reduced to the ſame diet and exerciſe.

77
Why they have few children.

"They raiſe few children."—They, indeed, raiſe fewer children than we do; the cauſes of which are to be found not in a difference of nature, but of circumſtance. The women very frequently attending the men in their parties of war and of hunting, child-bearing becomes extremely inconvenient to them. It is ſaid, therefore, that they have learned the practice of procuring abortion by the uſe of certain vegetables; and that they even tend to prevent conception for a conſiderable time after. During theſe parties, they are expoſed to numerous hazards, to exceſſive exertions, to the greateſt extremities of hunger. Even at their homes, the nation depends for food, through a certain part of every year, on the gleanings of the foreſt; that is, they experience a famine once in every year. With all animals, if the female be badly fed, or not fed at all, her young periſh; and if both male and female be reduced to like want, generation becomes leſs active, leſs productive. To the obſtacles, then, of want and hazard, which nature has oppoſed to the multiplication of wild animals for the purpoſe of reſtraining their numbers within certain bounds, thoſe of labour and of voluntary abortion are added with the Indian. No wonder, then, if they multiply leſs than we do. Where food is regularly ſupplied, a ſingle farm will ſhow more of cattle than a whole country of foreſts can of buffaloes. The ſame Indian women, when married to white traders, who feed them and their children plentifully and regularly, who exempt them from exceſſive drudgery, who keep them ſtationary and unexpoſed to accident, produce, and raiſe, as many children as the white women. Inſtances are known, under theſe circumſtances, of their rearing a dozen children.

78
Of their ſenſibility, &c.

Neither do they ſeem to be "deficient in natural affection." On the contrary their ſenſibility is keen, even the warriors weeping moſt bitterly on the loſs of their children, though, in general, they endeavour to appear ſuperior to human events.

Their friendſhips are ſtrong, and faithful, to the uttermoſt extremity. A remarkable inſtance of this appeared in the caſe of the late Col. Byrd, of Virginia, who was ſent to the Cheerake nation to tranſact ſome buſineſs with them. It happened that ſome of our diſorderly people had juſt killed one or two of that nation. It was, therefore, propoſed in the council of the Cheerake, that Col. Byrd ſhould be put to death in revenge for the loſs of their countrymen. Among them was a chief called *Silòuee*, who, on ſome former occaſion, had contracted an acquaintance and friendſhip with Col. Byrd. He came to him every night, in his tent, and told him not to be afraid, they ſhould not kill him. After many days deliberation, however, the determination was, contrary to Silòuee's expectation, that Byrd ſhould be put to death, and ſome warriors were diſpatched as executioners. Silòuee attended them; and when they entered the tent, he threw himſelf between them and Byrd, and ſaid to the warriors, "This man is my friend: before you get at him, you muſt kill me." On which they returned; and the council reſpected the principle ſo much as to recede from their determination.

79 Of their ourage. See alſo ° 59, 60, pra.)

That "they are timorous and cowardly" is a character with which there is little reaſon to charge them, when we recollect the manner in which the Iroquois met Monſ. ———, who marched into their country; in which the old men, who ſcorned to fly, or to ſurvive the capture of their town, braved death, like the old Romans, in the time of the Gauls, and in which they ſoon after revenged themſelves by ſacking and deſtroying Montreal. In ſhort, the Indian is brave, when an enterpriſe depends on bravery; education with him making the point of honour to conſiſt in the deſtruction of an enemy by ſtratagem, and in the preſervation of his own perſon free from injury: or, perhaps, this is nature, while it is education which teaches us to honour force more than fineſſe. He will defend himſelf againſt an hoſt of enemies, always chooſing to be killed rather than to ſurrender, though it be to the whites, who, he knows, will treat him well. In other ſituations, alſo, he meets death with more deliberation; and endures tortures with a firmneſs unknown almoſt to religious enthuſiaſm among us.

Much leſs are they to be characterized as a people of no vivacity, and who are excited to action or motion only by the calls of hunger and thirſt. Their dances, in which they ſo much delight, and which to a European would be the moſt ſevere exerciſe, fully contradict this; not to mention their fatiguing marches, and the toil they voluntarily and cheerfully undergo in their military expeditions. It is true, that when at home they do not employ themſelves in labour or the culture of the ſoil: but this, again, is the effect of cuſtoms and manners which have aſſigned that to the province of the women. But it is ſaid, "they are averſe to ſociety and a ſocial life." Can any thing be more inapplicable than this, to a people who always live in towns, or in clans? Or can they be ſaid to have no *republique*, who conduct all their affairs in national councils; who pride themſelves in their national character; who conſider an inſult or injury, done to an individual by a ſtranger, as done to the whole, and reſent it, accordingly?

To form a juſt eſtimate of their genius and mental powers, Mr Jefferſon obſerves, more facts are wanting, and great allowance is to be made for thoſe circumſtances of their ſituation which call for a diſplay of particular talents only. This done, we ſhall, probably, find that the Americans are formed, in mind as well as in body, on the ſame model with the *homo ſapiens Europæus*. The principles of their ſociety forbidding all compulſion, they are to be led to duty and to enterpriſe by perſonal influence and perſuaſion. Hence eloquence in council, bravery and addreſs in war, become the foundations of all conſequence with them. To theſe acquirements all their faculties are directed. Of their bravery and addreſs in war we have multiplied proofs, becauſe we have been the ſubjects on which they were exerciſed. Of their eminence in oratory we have fewer examples, becauſe it is diſplayed chiefly in their own councils. Some, however, we have of very ſuperior luſtre. We may challenge the whole orations of Demoſthenes and Cicero, and of any more eminent orator, if Europe has furniſhed more eminent, to produce a ſingle paſſage ſuperior to the ſpeech of Logan, a Mingo chief, to Lord Dunmore, when governor of Virginia.

80 Story of Logan.

The ſtory is as follows; of which, and of the ſpeech, the authenticity is unqueſtionable. In the ſpring of the year 1774, a robbery and murder were committed on an inhabitant of the frontiers of Virginia by two Indians, of the Shawanae tribe. The neighbouring whites, according to their cuſtom, undertook to puniſh this outrage, in a ſummary way. Colonel Creſap, a man infamous for the many murders he had committed on thoſe much-injured people, collected a party, and proceeded down the Kanhaway, in queſt of vengeance. Unfortunately, a canoe of women and children, with one man only, was ſeen coming from the oppoſite ſhore, unarmed, and unſuſpecting any hoſtile attack from the whites. Creſap and his party concealed themſelves on the bank of the river; and the moment the canoe reached the ſhore, ſingled out their objects, and, at one fire, killed every perſon in it. This happened to be the family of Logan, who had long been diſtinguiſhed as a friend of the whites. This unworthy return provoked his vengeance. He accordingly ſignalized himſelf in the war which enſued. In the autumn of the ſame year, a deciſive battle was fought at the mouth of the Great-Kanhaway, between the collected forces of the Shawanaes, Mingoes, and Delawares, and a detachment of the Virginia militia. The Indians were defeated, and ſued for peace. Logan, however, diſdained to be ſeen among the ſuppliants; but, leſt the ſincerity of a treaty ſhould be diſtruſted from which ſo diſtinguiſhed a chief abſented himſelf, he ſent, by a meſſenger, the following ſpeech, to be delivered to Lord Dunmore:—"I appeal to any white man to ſay if ever he entered Logan's cabin hungry, and he gave him not meat; if ever he came cold and naked, and he clothed him not. During the courſe of the laſt long and bloody war, Logan remained idle in his cabin, an advocate for peace. Such was my love for the whites, that my countrymen pointed as they paſſed, and ſaid, *Logan is the friend of white men*. I had even thought to have lived with you, but for the injuries of one man. Colonel Creſap, the laſt ſpring, in cold blood, and unprovoked, murdered all the relations of Logan, not ſparing even my women and

81 Specimen of Indian eloquence.

and children. There runs not a drop of my blood in the veins of any living creature. This called on me for revenge. I have ſought it; I have killed many; I have fully glutted my vengeance. For my country, I rejoice at the beams of peace; but do not harbour a thought that mine is the joy of fear. Logan never felt fear. He will not turn on his heel to ſave his life. Who is there to mourn for Logan? Not one."

82
Other anecdotes.

To the preceding anecdotes, in favour of the American character, may be added the following, by Dr Benjamin Franklin.—The Indian men, when young, are hunters and warriors; when old, counſellors; for all their government is by the counſel or advice of the ſages. Hence, they generally ſtudy oratory; the beſt ſpeakers having the moſt influence. The Indian women till the ground, dreſs the food, nurſe and bring up the children, and preſerve and hand down to poſterity the memory of public tranſactions. Theſe employments of men and women are accounted natural and honourable. Having few artificial wants, they have abundance of leiſure for improvement by converſation. Our laborious manner of life, compared with theirs, they eſteem ſlaviſh and baſe; and the learning on which we value ourſelves, they regard as frivolous and uſeleſs.

Having frequent occaſions to hold public councils, they have acquired great order and decency in conducting them. The old men ſit in the foremoſt rank, the warriors in the next, and the women and children in the hindmoſt. The buſineſs of the women is to take exact notice of what paſſes; imprint it in their memories, for they have no writing, and communicate it to their children. They are the records of the council, and they preſerve tradition of the ſtipulations in treaties a hundred years back; which, when we compare with our writings, we always find exact. He that would ſpeak, riſes. The reſt obſerve a profound ſilence. When he has finiſhed, and ſits down, they leave him five or ſix minutes to recollect, that if he has omitted any thing he intended to ſay, or has any thing to add, he may riſe again and deliver it. To interrupt another, even in common converſation, is reckoned highly indecent.

83
Politeneſs and civility of the American Indians.

The politeneſs of theſe ſavages in converſation is, indeed, carried to exceſs; ſince it does not permit them to contradict, or deny, the truth of what is aſſerted in their preſence. By theſe means they, indeed, avoid diſputes; but then it becomes difficult to know their minds, or what impreſſion you make upon them. The miſſionaries, who have attempted to convert them to Chriſtianity, all complain of this, as one of the great difficulties of their miſſion. The Indians hear, with patience, the truths of the goſpel explained to them, and give their uſual tokens of aſſent and approbation; but this by no means implies conviction: it is mere civility.

When any of them come into our towns, our people are apt to croud round them, gaze upon them, and incommode them when they deſire to be private; this they eſteem great rudeneſs, and the effect of the want of inſtruction in the rules of civility, and good manners. "We have," ſay they, "as much curioſity as you; and when you come into our towns, we wiſh for opportunities of looking at you; but for this purpoſe we hide ourſelves behind buſhes where you are to paſs, and never intrude ourſelves into your company."

84
Their hoſpitality.

Their manner of entering one another's villages has likewiſe its rules. It is reckoned uncivil in travelling ſtrangers to enter a village abruptly, without giving notice of their approach. Therefore, as ſoon as they arrive within hearing, they ſtop and hollow, remaining there till invited to enter. Two old men uſually come out to them, and lead them in. There is in every village a vacant dwelling, called the *ſtrangers-houſe*. Here they are placed, while the old men go round from hut to hut, acquainting the inhabitants that ſtrangers are arrived, who are, probably, hungry and weary; and every one ſends them what he can ſpare of victuals, and ſkins to repoſe on. When the ſtrangers are refreſhed, pipes and tobacco are brought; and then, but not before, converſation begins, with inquiries who they are, whither bound, what news, &c. and it uſually ends with offers of ſervice; if the ſtrangers have occaſion for guides, or any neceſſaries, for continuing their journey; and nothing is exacted for the entertainment.

The ſame hoſpitality, eſteemed among them as a principal virtue, is practiſed by private perſons; of which Conrad Weiſer, a celebrated interpreter of the Indian languages, gave Dr Franklin the following inſtance. He had been naturalized among the Six-Nations, and ſpoke well the Mohock language. In going through the Indian country, to carry a meſſage from our governor to the council at Onondaga, he called at the habitation of Canaſſetego, an old acquaintance, who embraced him, ſpread furs for him to ſit on, placed before him ſome boiled beans and veniſon, and mixed ſome rum and water for his drink. When he was well refreſhed, and had lit his pipe, Canaſſetego began to converſe with him: aſked how he had fared the many years ſince they had ſeen each other, whence he then came, what had occaſioned the journey, &c. Conrad anſwered all his queſtions; and when the diſcourſe began to flag, the Indian, to continue it, ſaid, "Conrad, you have lived long among the white people, and know ſomething of their cuſtoms; I have been ſometimes at Albany, and have obſerved that once in ſeven days they ſhut up their ſhops, and aſſemble all in the great houſe; tell me what it is for?—What do they do there?" "They meet there," ſays Conrad, "to hear and learn *good things*." "I do not doubt," ſays the Indian, "that they tell you ſo; they have told me the ſame: but I doubt the truth of what they ſay, and I will tell you my reaſons. I went lately to Albany to ſell my ſkins, and buy blankets, knives, powder, rum, &c. You know I generally uſed to deal with Hans Hanſon; but I was a little inclined, this time, to try ſome other merchants. However, I called firſt upon Hans, and aſked him what he would give for beaver. He ſaid he could not give more than 4s. a pound; but (ſays he) I cannot talk on buſineſs now; this is the day when we meet together to learn *good things*, and I am going to the meeting. So, I thought to myſelf, ſince I cannot do any buſineſs to-day, I may as well go to the meeting too; and I went with him.—There ſtood up a man in black, and began to talk to the people, very angrily. I did not underſtand what he ſaid; but perceiving that he looked much at me and at Hanſon, I imagined he was angry at ſeeing me there: ſo I went out, ſat down near the houſe, ſtruck fire, and lit my pipe, waiting till the meeting ſhould break up. I thought, too, that the man had mentioned ſomething of beaver, and I ſuſpected that it might be the ſubject of their meeting. So when they came out, I accoſted my merchant.—Well, Hans, (ſays I) I hope you have agreed to give more than 4s. a pound?" "No, (ſays he) I cannot give ſo much, I cannot give more than 3s. 6d." "I then ſpoke to ſeveral other dealers, but they all ſung the ſame ſong, three and ſix-pence, three and ſix-pence. This made it clear to me that my ſuſpicion was right; and that whatever they pretended of meeting to learn *good things*, the real purpoſe was, to conſult how to cheat Indians in the price of beaver. Conſider but a little, Conrad, and you muſt be of my opinion. If they met ſo often to learn *good things*, they certainly would have learned ſome before this time. But they are ſtill ignorant. You know our practice. If a white man, in travelling through our country, enters one of our cabins, we all treat him as I treat you; we dry him if he is wet, we warm him if he is cold, and give him meat and drink, that he may allay his thirſt and hunger; and we ſpread ſoft furs for him to reſt and ſleep on: we demand nothing in return. But if I go into a white-man's houſe at Albany, and aſk for victuals and drink, they ſay, Where is your money? And if I have none, they ſay, Get out, you Indian dog. You ſee they have not yet learned thoſe little *good things* that we need no meeting to be inſtructed in; becauſe our mothers taught them to us when we were children; and, therefore, it is impoſſible their meetings ſhould be, as they ſay, for any ſuch purpoſe, or have any ſuch effect; they are only to contrive *the cheating of Indians in the price of beaver*."

The next queſtion which offers itſelf to our notice, is, Whether the peculiarities of the *aboriginal Americans*, or the diſparity between them and the inhabitants of the Old-World, afford ſufficient grounds for determining *them*, as many eminent writers have done, to be a *race of men radically different from all others?*

In this queſtion, to avoid being tedious, we ſhall confine ourſelves to what has been advanced by Lord Kames; who is of opinion, that there are many different ſpecies of men, as well as of other animals; and gives an hypotheſis, whereby he pretends his opinion may be maintained in a conſiſtency with Revelation.

85
Lord Kames's arguments for different ſpecies.

"If (ſays he) the only rule afforded by nature for claſſing animals can be depended on, there are different races of men as well as of dogs: a maſtiff differs not more from a ſpaniel, than a white man from a negro, or a Laplander from a Dane. And, if we have any faith in Providence, it ought to be ſo. Plants were created of different kinds, to fit them for different climates; and ſo were brute animals. Certain it is, that all men are not fitted equally for every climate. There is ſcarce a climate but what is natural to ſome men, where they proſper and flouriſh; and there is not a climate, but where ſome men degenerate. Doth not then analogy lead us to conclude, that, as there are different climates on the face of this globe, ſo there are different races of men fitted for theſe different climates?

"M. Buffon, from the rule, That animals which can procreate together, and whoſe progeny can alſo procreate, are of one ſpecies; concludes, that all men are of one race or ſpecies; and endeavours to ſupport that favourite opinion, by aſcribing to the climate, to food, or to other accidental cauſes, all the varieties that are found among men. But is he ſeriouſly of opinion, that any operation of climate, or of other accidental cauſe, can account for the copper colour and ſmooth chin univerſal among the Americans; the prominence of the pudenda univerſal among the Hottentot women, or the black nipple no leſs univerſal among the female Samoiedes?—It is in vain to aſcribe to the climate, the low ſtature of the Eſquimaux, the ſmallneſs of their feet, or the overgrown ſize of their heads. It is equally in vain to aſcribe to climate the low ſtature of the Laplanders, or their ugly viſage. The black colour of negroes, thick lips, flat noſe, criſped woolly hair, and rank ſmell, diſtinguiſh them from every other race of men. The Abyſſinians, on the contrary, are tall and well made, their complexion a brown olive, features well-proportioned, eyes large and of a ſparkling black, thin lips, a noſe rather high than flat. There is no ſuch difference of climate between Abyſſinia and Negro-land as to produce theſe ſtriking differences.

"Nor ſhall our author's ingenious hypotheſis concerning the extremities of heat and cold, purchaſe him impunity with reſpect to the ſallow complexion of the Samoiedes, Laplanders, and Greenlanders. The Finlanders, and northern Norwegians, live in a climate not leſs cold than that of the people mentioned; and yet are fair beyond other Europeans. I ſay, more, there are many inſtances of races of people preſerving their original colour, in climates very different from their own; but not a ſingle inſtance of the contrary, as far as I can learn. There have been four complete generations of negroes in Pennſylvania, without any viſible change of colour; they continue jet black, as originally. Thoſe who aſcribe all to the ſun, ought to conſider how little probable it is, that the colour it impreſſes on the parents ſhould be communicated to their infant children who never ſaw the ſun: I ſhould be as ſoon induced to believe, with a German naturaliſt, whoſe name has eſcaped me, that the negro colour is owing to an ancient cuſtom in Africa, of dyeing the ſkin black. Let a European, for years, expoſe himſelf to the ſun, in a hot climate, till he be quite brown; the children will, nevertheleſs, have the ſame complexion with thoſe in Europe. From the action of the ſun, is it poſſible to explain, why a negro, like a European, is born with a ruddy ſkin, which turns jet black, the eighth, or ninth, day?"

Our author next proceeds to draw ſome arguments for the exiſtence of different races of men, from the various tempers and diſpoſitions of different nations; which he reckons to be *ſpecific* differences, as well as thoſe of colour, ſtature, &c. and having ſummed up his evidence, he concludes thus: "Upon ſumming up the whole particulars, mentioned above, would one heſitate a moment, to adopt the following opinion, were there no counterbalancing evidence, viz. 'That God 'created many pairs of the human race, differing 'from each other, both externally and internally; that 'he fitted thoſe pairs for different climates, and placed 'each pair in its proper climate; that the peculi'arities of the original pairs were preſerved entire 'in their deſcendants; who, having no aſſiſtance but 'their natural talents, were left to gather knowledge 'from experience; and, in particular, was left (each 'tribe) to form a language for itſelf; that ſigns were

86 His hypotheſis concerning the origin of the different ſpecies.

‘ ſufficient for the original pairs, without any language ‘ but what nature ſuggeſts; and that a language was ‘ formed gradually, as a tribe increaſed in numbers, ‘ and in different occupations, to make ſpeech neceſſary?” But this opinion, however plauſible, we are not permitted to adopt; being taught a different leſſon by Revelation, viz. That God created but a ſingle pair of the human ſpecies. Though we cannot doubt the authority of Moſes, yet his account of the creation of man is not a little puzzling, as it ſeems to contradict every one of the facts mentioned above. According to that account, different races of men were not formed, nor were men formed originally for different climates. All men muſt have ſpoken the ſame language, viz. That of our firſt parents. And what of all ſeems the moſt contradictory to that account, is the ſavage ſtate: Adam, as Moſes informs us, was endued by his Maker with an eminent degree of knowledge; and he certainly was an excellent preceptor to his children and their progeny, among whom he lived many generations. Whence then the degeneracy of all men unto the ſavage ſtate? To account for that diſmal cataſtrophe, mankind muſt have ſuffered ſome terrible convulſion. That terrible convulſion is revealed to us in the hiſtory of the tower of Babel, contained in the 11th chapter of Geneſis, which is, ‘That, for many centuries after the deluge, the whole earth was of one ‘ language, and of one ſpeech; that they united to ‘ build a city on the plain in the land of Shinar, with a ‘ tower, whoſe top might reach unto heaven; that the ‘ Lord, beholding the people to be one, and to have ‘ all one language, and that nothing would be reſtrained from them which they imagined to do, con‘founded their language, that they might not under‘ſtand one another, and ſcattered them abroad upon ‘ the face of all the earth.’ Here, light breaks forth in the midſt of darkneſs. By confounding the language of men, and ſcattering them abroad upon the face of all the earth, they were rendered ſavages. And to harden them for their new habitations, it was neceſſary that they ſhould be divided into different kinds, fitted for different climates. Without an immediate change of conſtitution, the builders of Babel could not poſſibly have ſubſiſted in the burning region of Guinea, nor in the frozen region of Lapland; houſes not being prepared, nor any other convenience to protect them againſt a deſtructive climate.”

87 Incomplete.

We may, firſt, remark on his Lordſhip's hypotheſis, that it is evidently incomplete: for, allowing the human race to have been divided into different ſpecies, at the confuſion of languages, and that each ſpecies was adapted to a particular climate: by what means were they to get to the climates proper for them, or how were they to know that ſuch climates exiſted? How was an American, for inſtance, when languiſhing in an improper climate at Babel, to get to the land of the Amazons, or, the banks of the Oroonoko, in his own country? Or how was he to know that theſe places were more proper for him than others?—If, indeed, we take the ſcripture phraſe, “The Lord *ſcattered them abroad* upon the face of all the earth,” in a certain ſenſe, we may account for it. If we ſuppoſe that the different ſpecies were immediately carried off by a whirlwind, or other ſupernatural means, to their proper countries, the difficulty will vaniſh: but if this is his Lordſhip's interpretation, it is certainly a very ſingular one.

88 General principles to be kept in view in reaſoning on this ſubject.

Before entering upon the conſideration of the particular arguments uſed by our author for proving the diverſity of ſpecies in the human race, it will be proper to lay down the following general principles, which may ſerve as axioms. (1). When we aſſert a multiplicity of ſpecies in the human race: we bring in a ſupernatural cauſe to ſolve a natural phenomenon: for theſe ſpecies are ſuppoſed to be the immediate work of the Deity. (2). No perſon has a right to call any thing the immediate effect of omnipotence, unleſs by expreſs revelation from the Deity, or from a certainty that no natural cauſe is ſufficient to produce the effect. The reaſon is plain. The Deity is inviſible, and there are many natural cauſes: when we ſee an effect, therefore, of which the cauſe does not manifeſt itſelf, we cannot know whether the immediate cauſe is the Deity, or an inviſible natural power. An example of this we have in the phenomena of thunder and earthquakes, which were often aſcribed immediately to the Deity, but are now diſcovered to be the effects of electricity. (3). No perſon can aſſert natural cauſes to be inſufficient to produce ſuch and ſuch effects, unleſs he perfectly knows all theſe cauſes, and the limits of their power in all poſſible caſes; and this no man has ever known, or can know.

By keeping in view theſe principles, which we hope are ſelf-evident, we will eaſily ſee lord Kames's arguments to conſiſt entirely in a *petitio principii.*—In ſubſtance, they are all reduced to this ſingle ſentence: “Natural philoſophers have been, hitherto, unſucceſsful in their endeavours to account for the differences obſerved among mankind, therefore theſe diferences cannot be accounted for from natural cauſes.”

89 Inconſiſtency in Lord Kames's arguments.

His Lordſhip, however, tells us in the paſſages already quoted, that “a maſtiff differs not more from a ſpaniel, than a Laplander from a Dane;” that “it is vain to aſcribe to climate the low ſtature of the Laplanders, or their ugly viſage.—Yet, in a note on the word *Laplanders,* he ſubjoins, that, “by late accounts it appears, that the Laplanders are only degenerated Tartars; and that they and the Hungarians originally ſprung from the ſame breed of men, and from the ſame country.”—The Hungarians are generally handſome and well-made, like Danes, or like other people. The Laplanders, he tells us, differ as much from them as a maſtiff from a ſpaniel. Natural cauſes, therefore, according to Lord Kames himſelf, may cauſe two individuals of the ſame ſpecies of mankind differ from each other as much as a maſtiff does from a ſpaniel.

90 Remarkable difference of colour from accidental cauſes.

While we are treating this ſubject of colour, it may not be amiſs to obſerve, that a very remarkable difference of colour may accidentally happen to individuals of the ſame ſpecies. In the iſthmus of Darien, a ſingular race of men have been diſcovered.—They are of low ſtature, of a feeble make, and incapable of enduring fatigue. Their colour is a dead milk white; not reſembling that of fair people among Europeans, but without any bluſh or ſanguine complexion. Their ſkin is covered with a fine hairy down of a chalky white; the hair of their heads, their eye-brows, and eye-laſhes, are of the ſame hue. Their eyes are of a ſingular form, and ſo weak, that they can hardly bear the light of the ſun; but they ſee clearly by moon-light, and are moſt active and gay in the night. Among the negroes of Africa, as well as the natives of the Indian iſlands, a ſmall number of theſe people are produced. They are called *Albinos* by the Portugueſe, and *Kackerlakes* by the Dutch.

91 Colour no characteriſtic of a different ſpecies.

This race of men is not indeed permanent; but it is ſufficient to ſhow, that mere *colour* is by no means the characteriſtic of a certain ſpecies of mankind. The difference of colour in theſe individuals is undoubtedly owing to a natural cauſe. To conſtitute, then, a race of men of this colour, it would only be neceſſary that this cauſe, which at preſent is merely accidental, ſhould become permanent, and we cannot know but it may be ſo in ſome parts of the world.

92 Nor ſtature

If a difference of colour is no characteriſtic of a different ſpecies of mankind, much leſs can a difference in ſtature be thought ſo. In the ſouthern parts of America, there are ſaid to be a race of men exceeding the common ſize in height and ſtrength*. This account, however, is doubted of by ſome; but be that as it will, it is certain that the Eſquimaux are as much under the common ſize, as the Patagonians are ſaid to be above it. Neverthe1eſs, we are not to imagine, that either of theſe are ſpecific differences; ſeeing the Laplanders and Hungarians are both of the ſame ſpecies, and yet the former are generally almoſt a foot ſhorter than the latter; and if a difference of climate, or other accidental cauſes, can make the people of one country a foot ſhorter than the common ſize of mankind, undoubtedly accidental cauſes of a contrary nature may make thoſe of another country a foot taller than other men.

* See *Patagonia.*

93 Different cauſes contribute towards an alteration in colour.

Though the ſun has, moſt undoubtedly, a ſhare in the production of the ſwarthy colour of thoſe nations which are expoſed to its influence; yet the manner of living to which people are accuſtomed; their food, their employment, and many other circumſtances, muſt alſo contribute, not a little, to a difference of complexion. The more full examination, however, of theſe ſeveral circumſtances we reſerve for another article. See the article COMPLEXION.

94 Habit capable of altering the inſtinct of animals.

It is allowed on all hands, that it is more eaſy to work a change upon the body of a man, or any other animal, than upon his mind. A man who is naturally choleric may, indeed, learn to prevent the bad effects of his paſſion by reaſon, but the paſſion itſelf will remain as immutable as his colour.—But, to reaſon in a manner ſimilar to Lord Kames; though a man ſhould be naturally choleric, or ſubject to any other paſſion, why ſhould his children be ſo?—This way of reaſoning, however plauſible, is by no means concluſive, as will appear from the following paſſage in Mr Forſter's Voyage.

Voyage round the World, Vol. I. p. 234.

June 9th. "The officers who could not yet reliſh their ſalt proviſions after the refreſhments of New-Zealand, had ordered their black dog, mentioned p. 135, to be killed: this day, therefore, we dined, for the firſt time, on a leg of it roaſted; which taſted ſo exactly like mutton, that it was abſolutely undiſtinguiſhable. In our cold countries, where animal food is ſo much uſed, and where to be carnivorous, perhaps, lies in the nature of men, or is indiſpenſibly neceſſary to the preſervation of their health and ſtrength, it is ſtrange that there ſhould exiſt a Jewiſh averſion to dogs-fleſh, when hogs, the moſt uncleanly of all animals, are eaten without ſcruple. Nature ſeems expreſsly to have intended them for this uſe, by making their offspring ſo very numerous, and their increaſe ſo quick, and frequent. It may be objected, that the exalted degree of inſtinct which we obſerve in our dogs, inſpires us with great unwillingneſs to kill and eat them. But it is owing to the time we ſpend on the education of dogs, that they acquire thoſe eminent qualities, which attach them ſo much to us. The natural qualities of our dogs may receive a wonderful improvement; but education muſt give its aſſiſtance, without which the human mind itſelf, though capable of an immenſe expanſion, remains in a very contracted ſtate. In New-Zealand, and (according to former accounts of voyages) in the tropical iſles of the South-Sea, the dogs are the moſt ſtupid, dull animals imaginable, and do not ſeem to have the leaſt advantage in point of ſagacity over our ſheep, which are commonly made the emblems of ſillineſs. In the former country they are fed upon fiſh, in the latter on vegetables, and both theſe diets may have ſerved to alter their diſpoſition. Education may, perhaps, likewiſe, graft new inſtincts: the New-Zealand dogs are fed on the remains of their maſter's meals; they eat the bones of other dogs; and the puppies become true cannibals from their birth. We had a young New-Zealand puppy on board, which had certainly had no opportunity of taſting any thing but the mother's milk before we purchaſed it; however, it eagerly devoured a portion of the fleſh and bones of the dog on which we dined today; while ſeveral others of the European breed, taken on board at the Cape, turned from it without touching it.

Ibid. p. 243.

"On the 4th of Auguſt, a young bitch, of the terrier breed, taken on board at the Cape of Good-Hope, and covered by a ſpaniel, brought ten young ones, one of which was dead. The New-Zealand dog mentioned above, which devoured the bones of the roaſted dog, now fell upon the dead puppy, and eat of it, with a ravenous appetite. This is a proof how far education may go in producing, and propagating, new inſtincts in animals. European dogs are never fed on the meat of their own ſpecies, but rather ſeem to abhor it. The New-Zealand dogs, in all likelihood, are trained up, from their earlieſt age, to eat the remains of their maſter's meals: they are, therefore, uſed to feed upon fiſh; their own ſpecies; and, perhaps, human fleſh; and what was only owing to a habit, at firſt, may have become inſtinct, by length of time. This was remarkable in our cannibal dog; for he came on board ſo young, that he could not have been weaned long enough to have acquired a habit of devouring his own ſpecies, and much leſs of eating human fleſh; however, one of our ſeamen having cut his finger, held it out to the dog, who fell to greedily, licked it, and then began to bite it."

From this account it appears, that even the inſtincts of animals are not unchangeable by natural cauſes; and if theſe cauſes are powerful enough to change the diſpoſitions of ſucceeding generations, much more may we ſuppoſe them capable of making any poſſible alteration in the external appearance.

95 Confirmed by an obſervation on the Franks.

We are not here neceſſitated to confine ourſelves to obſervations made on brute animals. The Franks are an example of the production of one general character, formed by ſome natural cauſe from a mixture of many different nations.—They were a motley multitude, conſiſting of various German nations dwelling beyond the Rhine; who, uniting in defence of their common liberty, took thence the name of *Franks;* the word *frank* ſignifying in their language, as it ſtill does in ours, *free.* Among them the following nations were mentioned, viz. the Actuarii, Chamavi, Bructeri, Salii, Friſii, Chauſi, Amſwarii, and Catti. We cannot ſuppoſe one character to belong to ſo many different nations; yet it is certain that the Franks were, nationally, characterized as treacherous. It is in vain, then, to talk of different races of men, either from their colour, ſize, or prevaling diſpoſitions, ſeeing we have undeniable proofs that all theſe may be changed, in the moſt remarkable manner, by natural cauſes, without any miraculous interpoſition of the Deity.

96
Of the peopling of America.

The queſtions which now preſent themſelves to our notice are, From what part of the Old-World America has, moſt probably, been peopled?—And how was this peopling accompliſhed?—

Few *queſtions* in the hiſtory of mankind have been more agitated than theſe.—Philoſophers, and men of learning and ingenuity, have been ſpeculating upon *them,* ever ſince the diſcovery of the American-Iſlands, by Chriſtopher Columbus.—But notwitſtanding all the labours of Acoſta, of Grotius, and of many other writers of eminence, the ſubject ſtill affords an ample field for the reſearches of the man of ſcience, and for the fancies of the theoriſt.

Diſcoveries, long ago made, inform us, than an intercourſe between the Old-Continent and America might be carried on, with facility, from the north-weſt extremities of Europe and the north-eaſt boundaries of Aſia. In the ninth century the Norwegians diſcovered Greenland, and planted a colony there. The communication with that country was renewed in the laſt century by Moravian miſſionaries, in order to propagate their doctrines in that bleak and uncultivated region. By them we are informed that the north-weſt coaſt of Greenland is ſeparated from America by a very narrow ſtrait; that at the bottom of the bay it is highly probable that they are united; that the Eſquimaux of America perfectly reſemble the Greenlanders, in their aſpect, dreſs, and mode of living; and that a Moravian miſſionary, well acquainted with the language of Greenland, having viſited the country of the Eſquimaux, found, to his aſtoniſhment, that they ſpoke the ſame language with the Greenlanders, and were, in every reſpect, the ſame people. The ſame ſpecies of animals, too, are found in the contiguous regions. The bear, the wolf, the fox, the hare, the deer, the roebuck, the elk, frequent the foreſts of North-America, as well as thoſe in the north of Europe.

97
A communication between the Old and New-Continents, by two ways.

Other diſcoveries have proved, that if the two continents of Aſia and America be ſeparated at all, it is only by a narrow ſtrait. From this part of the Old-Continent, alſo, inhabitants may have paſſed into the New; and the reſemblance between the Indians of America and the eaſtern inhabitants of Aſia, would induce us to conjecture that they have a common origin. This is the opinion adopted by Dr Robertſon, in his Hiſtory of America *, where we find it accompanied with the following narrative.

"While thoſe immenſe regions which ſtretched eaſtward from the river Oby to the ſea of Kamtſchatka were unknown, or imperfectly explored, the north-eaſt extremities of our hemiſphere were ſuppoſed to be ſo far diſtant from any part of the New-World, that it was not eaſy to conceive how any communication ſhould have been carried on between them. But the Ruſſians, having ſubjected the weſtern part of Siberia to their empire, gradually extended their knowledge of that vaſt country, by advancing towards the eaſt into unknown provinces. Theſe were diſcovered by hunters in their excurſions after game, or by ſoldiers employed in levying the taxes; and the court of Moſcow eſtimated the importance of thoſe countries only by the ſmall addition which they made to its revenue. At length, Peter the Great aſcended the Ruſſian throne: His enlightened, comprehenſive mind, intent upon every circumſtance that could aggrandize his empire, or render his reign illuſtrious, diſcerned conſequences of thoſe diſcoveries, which had eſcaped the obſervation of his ignorant predeceſſors. He perceived, that, in proportion as the regions of Aſia extended towards the eaſt, they muſt approach nearer to America; that the communication between the two continents, which had long been ſearched for in vain, would probably be found in this quarter; and that, by opening this intercourſe, ſome part of the wealth and commerce of the weſtern world might be made to flow into his dominions by a new channel. Such an object ſuited a genius that delighted in grand ſchemes. Peter drew up inſtructions with his own hand for proſecuting this deſign, and gave orders for carrying it into execution.

"His ſucceſſors adopted his ideas, and purſued his plan. The officers whom the Ruſſian court employed in this ſervice, had to ſtruggle with ſo many difficulties, that their progreſs was extremely ſlow. Encouraged by ſome faint traditions among the people of Siberia concerning a ſucceſsful voyage in the year 1648 round the north-eaſt promontory of Aſia, they attempted to follow the ſame courſe. Veſſels were fitted out, with this view, at different times, from the rivers Lena and Kolyma; but in a frozen ocean, which nature ſeems not to have deſtined for navigation, they were expoſed to many diſaſters, without being able to accompliſh their purpoſe. No veſſel fitted out by the Ruſſian court ever doubled this formidable cape; we are indebted for what is known of thoſe extreme regions of Aſia, to the diſcoveries made in excurſions by land. In all thoſe provinces, an opinion prevails, that countries of great extent and fertility lie at no conſiderable diſtance from their own coaſts. Theſe the Ruſſians imagined to be part of America; and ſeveral circumſtances concurred not only in confirming them in this belief, but in perſuading them that ſome portion of that continent could not be very remote. Trees of various kinds, unknown in thoſe naked regions of Aſia, are driven upon the coaſt by an eaſterly wind. By the ſame wind floating ice is brought thither in a few days; flights of birds arrive annually from the ſame quarter; and a tradition obtains among the inhabitants, of an intercourſe formerly carried on with ſome countries ſituated to the eaſt.

"After weighing all theſe particulars, and comparing the poſition of the countries in Aſia which they had diſcovered, with ſuch parts in the north-weſt of America as were already known; the Ruſſian court formed ed a plan, which would have hardly occurred to any nation leſs accuſtomed to engage in arduous undertakings, and to contend with great difficulties. Orders were iſſued to build two veſſels at Ochotz, in the ſea of Kamtſchatka, to ſail on a voyage of diſcovery. Though that dreary uncultivated region furniſhed nothing that could be of uſe in conſtructing them but ſome larch-trees; though not only the iron, the cordage, the ſails, and all the numerous articles requiſite for their equipment, but the proviſions for victualling them, were to be carried through the immenſe deſarts of Siberia, along rivers of difficult navigation, and roads almoſt impaſſable, the mandate of the ſovereign, and the perſeverance of the people, at laſt ſurmounted every obſtacle. Two veſſels were finiſhed; and, under the command of captains Behring and Tſchirikow, ſailed from Kamtſchatka in queſt of the New-World, in a quarter where it had never been approached. They ſhaped their courſe towards the eaſt; and though a ſtorm ſoon ſeparated the veſſels, which never rejoined, and many diſaſters befel them, the expectations from the voyage were not altogether fruſtrated. Each of the commanders diſcovered land, which to them appeared to be part of the American continent; and, according to their obſervations, it ſeems to be ſituated within a few degrees of the north-weſt coaſt of California. Each ſet ſome of his people aſhore: but in one place the inhabitants fled as the Ruſſians approached; in another, they carried off thoſe who landed, and deſtroyed their boats. The violence of the weather, and the diſtreſs of their crews, obliged both to quit this inhoſpitable coaſt. In their return they touched at ſeveral iſlands, which ſtretch in a chain from eaſt to weſt between the country which they had diſcovered and the coaſt of Aſia. They had ſome intercourſe with the natives, who ſeemed to them to reſemble the North-Americans. They preſented to the Ruſſians the calumet, or pipe of peace, which is a ſymbol of friendſhip univerſal among the people of North-America, and an uſage of arbitrary inſtitution peculiar to them."

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* *Hiſtory of America,* Vol. II. p. 273.

98 Reaſon for ſuppoſing the two continents to have been once joined.

The more recent and accurate diſcoveries of that illuſtrious navigator Cooke, and of his ſucceſſor Clerke, have brought the matter ſtill nearer to certainty. The ſea, from the ſouth of Behring's Straits to the creſcent of iſles between Aſia and America, is very ſhallow. It deepens from theſe ſtraits (as the Britiſh ſeas do from thoſe of Dover) till ſoundings are loſt in the Pacific-Ocean; but that does not take place but to the ſouth of the iſles. Between them and the ſtraits is an increaſe from 12 to 54 fathoms, except only off St Thaddeus-Noſs, where there is a channel of greater depth. From the volcanic diſpoſition, it has been judged probable, not only that there was a ſeparation of the continents at the ſtraits of Behring, but that the whole ſpace from the iſles to that ſmall opening had once been occupied by land; and that the fury of the watry element, actuated by that of fire, had, in moſt remote times, ſubverted and overwhelmed the tract, and left the iſlands to ſerve as monumental fragments.

99 Probable cauſe of their ſubſequent ſeparation.

Without adopting all the fancies of Buffon, there can be no doubt, as the Abbé Clavigero obſerves, that our planet has been ſubject to great viciſſitudes ſince the deluge. Ancient and modern hiſtories confirm the truth which Ovid has ſung in the name of Pythagoras:

Vidi ego quod fuerat quondam ſolidiſſima tellus,
Eſſe fretum; vidi factas ex æquore terras.

At preſent, they plough thoſe lands over which ſhips, formerly, ſailed, and now they ſail over lands which were, formerly, cultivated: earthquakes have ſwallowed ſome lands, and ſubterraneous fires have thrown up others: the rivers have formed new ſoil with their mud: the ſea, retreating from the ſhores, has lengthened the land in ſome places, and advancing in others has diminiſhed it; it has ſeparated ſome territories which were formerly united, and formed new ſtraits and gulphs. We have examples of all theſe revolutions in the paſt century. Sicily was united to the continent of Naples, as Eubea, now the Black-Sea, was to Bœotia. Diodorus, Strabo, and other ancient authors, ſay the ſame thing of Spain, and of Africa, and affirm, that by a violent eruption of the ocean upon the land between the mountains Abyla and Calpe, that communication was broken, and the Mediterranean-Sea was formed. Among the people of Ceylon there is a tradition that a ſimilar irruption of the ſea ſeparated their iſland from the peninſula of India. The ſame thing is believed by thoſe of Malabar with reſpect to the iſles of Maldivia, and with the Malayans with reſpect to Sumatra. It is certain, ſays the count de Buffon, that in Ceylon the earth has loſt 30 or 40 leagues, which the ſea has taken from it; on the contrary, Tongres, a place of the Low-Countries, has gained 30 leagues of land from the ſea. The northern part of Egypt owes its exiſtence to inundations of the Nile. The earth which this river has brought from the inland countries of Africa, and depoſited in its inundations, has formed a ſoil of more than 25 cubits of depth. In like manner, adds the above author, the province of the Yellow-River in China, and that of Louiſiana, have only been formed of the mud of rivers. Pliny, Seneca, Diodorus, and Strabo, report innumerable examples of ſimilar revolutions, which we omit, that our diſſertation may not become too prolix; as alſo many modern revolutions, which are related in the theory of the earth of the Count de Buffon and other authors. In South America, all thoſe who have obſerved with philoſophic eyes the peninſula of Yucatan, do not doubt that that country has once been the bed of the ſea; and, on the contrary, in the channel of Bahama, many indications ſhow the iſland of Cuba to have been once united to the continent of Florida. In the ſtrait which ſeparates America from Aſia many iſlands are found, which probably were the mountains belonging to that tract of land which we ſuppoſe to have been ſwallowed up by earthquakes; which is made more probable by the multitude of volcanoes which we know of in the peninſula of Kamtſchatka. It is imagined, however, that the ſinking of that land, and the ſeparatiion of the two continents, has been occaſioned by thoſe great and extraordinary earthquakes mentioned in the hiſtories of the Americans, which formed an æra almoſt as memorable as that of the deluge. The hiſtories of the Toltecas fix ſuch earthquakes in the year I Tecpatl; but as we know not to what century that belonged, we can form no conjecture of the time that great calamity happened. If a great earthquake ſhould overwhelm the iſthmus of Suez, and there ſhould be at the ſame time as great a ſcarcity of hiſtorians as there were in the firſt ages after the deluge, it would be doubted, in 300 or 400 years after, whether Aſia had ever been united by that part to Africa; and many would firmly deny it.

100
Separated only by a narrow ſtrait.

101
Eaſineſs of the paſſage between them.

Whether that great event, the ſeparation of the continents, took place before or after the population of America, it is impoſſible for us to determine: but we are indebted to the abovementioned navigators for ſettling the long diſpute about the point from which it was effected. Their obſervations prove, that in one place the diſtance between continent and continent is only 39 miles, not (as the author of the *Recherches Philoſophiques ſur les Americains* would have it) 800 leagues. This narrow ſtrait has alſo in the middle two iſlands, which would greatly facilitate the migration of the Aſiatics into the New-World, ſuppoſing that it took place in canoes after the convulſion which rent the two continents aſunder. Beſides, it may be added, that theſe ſtraits are, even in the ſummer, often filled with ice; in winter, often frozen. In either caſe, mankind might find an eaſy paſſage; in the laſt, the way was extremely ready for quadrupeds to croſs and ſtock the continent of America. But where, from the vaſt expanſe of the north-eaſtern world, to fix on the firſt tribes who contributed to people the New-Continent, now inhabited almoſt from end to end, is a matter that baffles human reaſon. The learned may make bold and ingenious conjectures, but plain good ſenſe cannot always accede to them.

102
Conjectures concerning the firſt migrations into the New-Continent.

As mankind increaſed in numbers, they naturally protruded one another forward. Wars might be another cauſe of migrations. There appears no reaſon why the Aſiatic north might not be an *officina virorum*, as well as the European. The overteeming country, to the eaſt of the Riphæan-Mountains, muſt find it neceſſary to diſcharge its inhabitants: the firſt great wave of people was forced forward by the next to it, more tumid and more powerful than itſelf: ſucceſſive and new impulſes continually arriving, ſhort reſt was given to that which ſpread over a more eaſtern tract; diſturbed again and again, it covered freſh regions; at length, reaching the fartheſt limits of the Old-World, found a new one, with ample ſpace to occupy unmoleſted for ages; till Columbus curſed them by a diſcovery, which brought again new ſins and new deaths to both worlds.

103
Mr Pennant's opinion.

“ The inhabitants of the New-World (Mr Pennant obſerves), do not conſiſt of the offspring of a ſingle nation: different people, at ſeveral periods, arrived there; and it is impoſſible to ſay, that any one is now to be found on the original ſpot of its colonization. It is impoſſible, with the lights which we have ſo recently received, to admit that America could receive its inhabitants (at leaſt the bulk of them) from any other place than Eaſtern-Aſia. A few proofs may be added, taken from cuſtoms or dreſſes common to the inhabitants of both worlds: ſome have been long extinct in the old, others remain in both in full force.

104
The bulk of its inhabitants probably firſt received from the eaſtern part of Aſia.

“ The cuſtom of ſcalping was a barbariſm in uſe with the Scythians, who carried about them, at all times, this ſavage mark of triumph: they cut a circle round the neck, and ſtripped off the ſkin, as they would that of an ox. A little image, found among the Kalmucs, of a Tartarian deity, mounted on a horſe, and ſitting on a human ſkin, with Scalps pendant from the breaſt, fully illuſtrates the cuſtom of the Scythian progenitors, as deſcribed by the Greek hiſtorian. This uſage, as we well know, by horrid experience, is continued to this day in America. The ferocity of the Scythians to their priſoners extended to the remoteſt part of Aſia. The Kamtſchatkans, even at the time of their diſcovery by the Ruſſians, put their priſoners to death by the moſt lingering and excruciating inventions; a practice in full force to this very day among the aboriginal Americans. A race of the Scythians were ſtyled *Anthropophagi*, from their feeding on human fleſh. The people of Nootka-Sound ſtill make a repaſt on their fellow-creatures; but what is more wonderful, the ſavage allies of the Britiſh army have been known to throw the mangled limbs of the French priſoners into the horrible cauldron, and devour them with the ſame reliſh as thoſe of a quadruped.

105
Proofs from a ſimilarity of cuſtoms, &c.

“ The Scythians were ſaid, for a certain time, annually to transform themſelves into wolves, and again to reſume the human ſhape. The new diſcovered Americans about Nootka-Sound, at this time, diſguiſe themſelves in dreſſes made of the ſkins of wolves, and other wild beaſts, and wear even the heads fitted to their own. Theſe habits they uſe in the chace, to circumvent the animals of the field. But would not ignorance or ſuperſtition aſcribe to a ſupernatural metamorphoſis theſe temporary expedients to deceive the brute creation?

106
Cuſtoms and dreſſes common to the eaſtern Aſiatics & the Americans.

“ In their marches, the Kamtſchatkans never went abreaſt, but followed one another in the ſame track. The ſame cuſtom is exactly obſerved by the Americans.

“ The Tunguſi, the moſt numerous nation reſident in Siberia, prick their faces with ſmall punctures, with a needle, in various ſhapes; then rub into them charcoal, ſo that the marks become indelible. This cuſtom is ſtill obſerved in ſeveral parts of America. The Indians on the back of Hudſon's Bay, to this day, perform the operation exactly in the ſame manner, and puncture the ſkin into various figures; as the natives of New-Zealand do at preſent, and as the ancient Britons did with the herb glaſtum, or woad; and the Virginians, on the firſt diſcovery of that country by the Engliſh.

“ The Tunguſi uſe canoes made of birch-bark, diſtended over ribs of wood, and nicely ſowed together. The Canadian, and many other American nations, uſe no other ſort of boats. The paddles of the Tunguſi, are broad at each end; thoſe of the people near Cook's river, and of Oonalaſcha, are of the ſame form.

“ In burying of the dead, many of the American nations place the corpſe at full length, after preparing it according to their cuſtoms; others place it in a ſitting poſture, and lay by it the moſt valuable cloathing, wampum, and other matters. The Tartars did the ſame: and both people agree in covering the whole with earth, ſo as to form a tumulus, barrow, or carnedd.

“ Some of the American nations hang their dead in trees. Certain of the Tunguſi obſerve a ſimilar cuſtom.

“ We can draw ſome analogy from dreſs; conveniency in that article muſt have been conſulted on both continents, and originally the materials muſt have been the ſame, the ſkins of birds and beaſts. It is ſingular, that the conic bonnet of the Chineſe ſhould be found among the people of Nootka. I cannot give into the notion, that the Chineſe contributed to the population of the New-World ; but we can, readily, admit, that a ſhipwreck might furniſh thoſe Americans with a pattern for that part of the dreſs.

107 Other reſemblances

“ In reſpect to the features and form of the human body, almoſt every tribe found along the weſtern coaſt has ſome ſimilitude to the Tartar nations, and, ſtill, retain the little eyes, ſmall noſes, high cheeks, and broad faces. They vary in ſize, from the luſty Calmucs to the little Nogaians. The internal Americans, ſuch as the Five-Indian nations, who are tall of body, robuſt in make, and of oblong faces, are derived from a variety among the Tartars themſelves. The fine race of Tſchutſki ſeems to be the ſtock from which thoſe Americans are derived. The Tſchutſki, again, from that fine race of Tartars the Kabardinſki, or inhabitants of Kabarda.

“ But, about Prince William's-Sound begins a race chiefly diſtinguiſhed by their dreſs, their canoes, and their inſtruments of the chace, from the tribes to the ſouth of them. Here commences the Eſquimaux people, or the race known by that name in the high latitudes of the eaſtern ſide of the continent. They may be divided into two varieties. At this place, they are of the largeſt ſize. As they advance northward, they decreaſe in height, till they dwindle into the dwarfiſh tribes which occupy ſome of the coaſts of the Icy-Sea, and the maritime parts of Hudſon's-Bay, of Greenland, and Terra de-Labrador. The famous Japaneſe map places ſome iſlands ſeemingly within the ſtraits of Behring, on which is beſtowed the title of *Ya-Zue*, or the Kingdom of the Dwarfs. Does not this in ſome manner authenticate the chart, and give us reaſon to ſuppoſe that America was not unknown to the Japaneſe ; and that they had (as is mentioned by Kæmpfer and Charlevoix) made voyages of diſcovery, and, according to the laſt, actually wintered on the continent ? That they might have met with the Eſquimaux is very probable ; whom, in compariſon of themſelves, they might juſtly diſtinguiſh by the name of *dwarfs*. The reaſon of their low ſtature is very obvious : theſe dwell in a moſt ſevere climate, amidſt penury of food ; the former in one much more favourable, abundant in proviſions ; circumſtances that tend to prevent the degeneracy of the human frame. At the iſland of Oonalaſcha, a dialect of the Eſquimaux is in uſe, which was continued along the whole coaſt from thence northward.”

108 The brute creation migrated by the ſame route.

The continent which ſtocked America with the human race, is ſuppoſed, by Mr. Pennant, to have poured in the brute creation, through the ſame paſſage. Very few quadrupeds continued in the peninſula of Kamtſchatka ; Mr Pennant enumerates only 25 which are inhabitants of land : all the reſt perſiſted in their migration, and fixed their reſidence in the New-World. Seventeen of the Kamtſchatkan quadrupeds are found in America : others are common only to Siberia, or Tartary, having, for unknown cauſes, entirely evacuated Kamtſchatka, and divided themſelves between America and the parts of Aſia above cited. Multitudes, again, have deſerted the Old-World, even to an individual, and fixed their ſeats at diſtances moſt remote from the ſpot from which they took their departure ; from mount Ararat, the reſting-place of the ark, in a central part of the Old-World, and excellently adapted for the diſperſion of the animal creation, to all its parts. “ We need not be ſtartled (ſays Mr Pennant) at the vaſt journeys many of the quadrupeds took to arrive at their preſent ſeats. Might not numbers of ſpecies have found a convenient abode in the vaſt alps of Aſia, inſtead of wandering to the Cordilleras of Chili ? or might not others have been contented with the boundleſs plains of Tartary, inſtead of travelling thouſands of miles to the extenſive flats of Pampas ?—To endeavour to elucidate common difficulties is certainly a trouble worthy of the philoſopher, and of the divine ; not to attempt it would be a criminal indolence, a neglect to

> Vindicate the ways of God to man.

But there are multitudes of points beyond the human ability to explain, and yet are truths undeniable : the facts are indiſputable, notwithſtanding the cauſes are concealed. In ſuch caſes, faith muſt be called in to our relief. It would, certainly, be the height of folly to deny to that Being who broke open the great fountains of the deep to effect the deluge—and afterwards, to compel the diſperſion of mankind to people the globe, directed the confuſion of languages—powers inferior in their nature to theſe. After theſe wondrous proofs of omnipotency, it will be abſurd to deny the poſſibility of infuſing inſtinct into the brute creation. *Deus eſt anima brutorum* ; “ God himſelf is the ſoul of brutes :” his pleaſure muſt have determined their will, and directed ſeveral ſpecies, and even whole genera, by impulſe irreſiſtible, to move by ſlow progreſſion to their deſtined regions. But for that, the llama and the pacos might ſtill have inhabited the heights of Armenia, and ſome more neighbouring Alps, inſtead of labouring to gain the diſtant Peruvian-Andes ; the whole genus of armadillos, ſlow of foot, would never have quitted the torrid zone of the Old-World for that of the New ; and the whole tribe of monkeys would have gamboled together in the foreſts of India, inſtead of dividing their reſidence between the ſhades of Indoſtan, and the deep foreſts of the Braſils. Lions and tigers might have infeſted the hot parts of the New-World, as the firſt do the deſarts of Africa, and the laſt the provinces of Aſia ; or the pantherine animals of South-America might have remained additional ſcourges with the ſavage beaſts of thoſe ancient continents. The Old-World would have been overſtocked with animals ; the New remained an unanimated waſte ! or both have contained an equal portion of every beaſt of the earth. Let it not be objected, that animals bred in a ſouthern climate, after the deſcent of their parents from the ark, would be unable to bear the froſt and ſnow of the rigorous north, before they reached South-America, the place of their final deſtination. It muſt be conſidered, that the migration muſt have been the work of ages ; that in the courſe of their progreſs each generation grew hardened to the climate it had reached ; and that, after their arrival in America, they would again be gradually accuſtomed to warmer and warmer climates, in their removal from north to ſouth, as they had in the reverſe, or from ſouth to north. Part of the tigers ſtill inhabit the eternal ſnows of Ararat, and multitudes of the very ſame ſpecies live, but with exalted rage, beneath the line, in the burning ſoil of Borneo, or Sumatra ; but neither lions or tigers ever migrated into the New-World. A few of the firſt are found in India and Perſia, but they are found in numbers only in Africa. The tiger extends as far north as weſtern Tartary, in lat. 40. 50, but never has reached America."

In fine, the conjectures of the learned reſpecting the vicinity of the Old and New-World are now, by the diſcoveries of late great navigators, loſt in conviction; and, in the place of imaginary hypotheſes, the real place of migration is almoſt incontrovertibly pointed out. Some (from a paſſage in Plato) have extended over the Atlantic, from the ſtraits of Gibraltar to the coaſt of North and South-America, an iſland equal in ſize to the continents of Aſia and Africa; over which had paſſed, as over a bridge, from the latter, men and animals; wool-headed negroes, and lions and tigers, none of which ever exiſted in the New-World. A mighty ſea aroſe, and, in one day and night, engulphed this ſtupendous tract, and with it every being which had not completed its migration into America. The whole negro race, and almoſt every quadruped, now inhabitants of Africa, periſhed in this critical day. Five only are to be found, at preſent, in America; and of theſe only one, the bear, in South-America: Not a ſingle cuſtom, common to the natives of Africa and America, to evince a common origin. Of the quadrupeds, the bear, ſtag, wolf, fox, and weeſel, are the only animals which we can pronounce, with certainty, to be found on each continent. The ſtag, the fox, and the weeſel, have made, alſo, no farther progreſs in Africa than the north; but on the ſame continent the wolf is ſpread over every part, yet is unknown in South-America, as are the fox and weeſel. In Africa and in South-America the bear is very local, being met with only in the north of the firſt, and on the Andes in the laſt. Some cauſe unknown arreſted its progreſs in Africa, and impelled the migration of a few into the Chilian-Alps, and induced them to leave unoccupied the vaſt tract from North-America to the lofty Cordilleras.

109
Remains of antiquity in America.

Alluſions have often been made by travellers, and others, to ſome remains in America which appeared to owe their original to a people more intimately acquainted with the arts of life than the *ſavage* tribes which inhabited this continent on its firſt diſcovery by the Europeans, or than thoſe which are, at preſent, ſcattered through various parts of its extent. In a ſmall work, publiſhed in London, in 1787, entitled *Obſervations on ſome parts of natural hiſtory: to which is prefixed, an account of ſeveral remarkable veſtiges of an ancient date, which have been diſcovered in different parts of America.* Part I. the author has collected the ſcattered hints of Kalm, of Carver, of Filſon, and ſome other travellers, and writers; and has added a plan and deſcription of a regular work, which he ſuppoſes to have been a *fortification,* that has been diſcovered near the confluence of the rivers Ohio and Muſkingum. The remains deſcribed, or alluded to, in this publication, are characters, or ſingular marks, which were ſuppoſed by ſome Jeſuits, who examined them, to be *Tartarian;* furrows, as if the land had been ploughed; a ſtone wall; mounds of earth, of different forms and ſizes; earthen walls, and ditches, &c.

The mounds of earth are ſuppoſed, by the author, to have been deſigned for different purpoſes: the *ſmaller* ones are, evidently, tumuli, or repoſitories of the dead; and, he thinks, the larger ones, as that at Grave-Creek (a branch of the Ohio); many which are to be ſeen in Mexico, and in other parts of America, were intended to ſerve as the baſes of temples.

The moſt curious part of this little work is the deſcription, together with the plan, of the ſuppoſed fortification, above alluded to. It is ſituated on the eaſt ſide of the river Muſkingum, about half a mile above its junction with the river Ohio, nearly in the latitude of 39. 21. and about 170 miles below Fort-Pitt, at the confluence of the rivers Alleghaney and Monaungahela. The town, as it has been, ſometimes, called, is a large level, encompaſſed by walls of a tetragon form; occupying a piece of ground about one quarter of a mile ſquare. Theſe walls are from ſix to ten feet in height, and from twenty to forty feet in thickneſs. They are, at preſent, overgrown with vegetables, of different kinds, and, among others, with trees, ſome of which are of a very conſiderable diameter. Each ſide of the walls is divided, by three chaſms, or openings, into four, nearly equal, parts: theſe chaſms are directly oppoſite to each other. Within the walls there are three elevations; the largeſt of theſe is of an oblong form, 74 yards long, 44 yards broad, and 6 feet in height: the ſecond is nearly of a ſimilar form, 50 yards long, and 40 broad: the third is, alſo, an oblong mount, but much ſmaller. Beſides theſe three elevations, there is a ſmall circular mount, placed nearly in the centre of four ſmall caves; and a "ſemi-circular parapet," which, it is not improbable, may have been deſigned to guard one of the chaſms, or openings: this parapet has a ſmall mount. The author obſerves, that the three elevations "conſiderably reſemble ſome of "the eminences which have been diſcovered near the "river Miſſiſſippi," of which he has given an account in his publication.

The fortifications (for a diſtinction has been made between them and the town, but we cannot ſee with what great propriety) are nearly of the ſame form as the town. The walls have here, alſo, openings: and at each of theſe openings there is one, or more of the ſmall circular mounts.

The pyramid is one of the moſt conſpicuous parts of theſe ſingular remains. It is of a circular form; 50 feet in height, 390 feet in circumference; and is ſurrounded with a ditch, 5 feet deep, and 15 feet wide: externally to the ditch there is a parapet, which is 759 feet in circumference. "The pyramid, as well as "the eminences and walls, is now covered with graſſes, "and other kinds of vegetables." Beſides theſe, there are ſeveral other eminences, of which we do not think it neceſſary to take any notice, in this place.

The author's opinion concerning theſe remains is this; that they owe their original to "the Toltecas, or ſome other Mexican nation," and that theſe people were, probably, the deſcendants of the Danes. The firſt member of this *conjecture* appears not improbable, if we conſider the ſimilarity of the Mexican mounts and fortifications, deſcribed by Torquemada, by the Abbé Clavigero, and by other authors, to thoſe of which our author has publiſhed an account; and, alſo, if we conſider the tradition of the Mexicans, that they came from the north-weſt, in which tract great numbers of theſe remains have been diſcovered. As to the ſecond member of this conjecture, we think it but feebly ſupported;

although we are not ignorant that Grotius and other writers have endeavoured to prove, that the northern nations of Europe had, actually, ſome intercourſe with America, long before the time of Columbus. See nº. 112. *infra.*

110
The ancients ſuppoſed to have had ſome imperfect notion of a new world.

It is believed, by many, that the ancients had ſome imperfect notion of the New-World; and ſeveral ancient authors are quoted in confirmation of this opinion. In a book, aſcribed to the philoſopher Ariſtotle, we are told that the Carthaginians diſcovered an iſland, far beyond the pillars of Hercules, large, fertile, and finely watered, with navigable rivers, but uninhabited. This iſland was diſtant a few days ſailing from the continent: its beauty induced the diſcoverers to ſettle there; but the policy of Carthage diſlodged the colony, and laid ſtrict prohibition on all the ſubjects of the ſtate not to attempt any future eſtabliſhment. This account is alſo confirmed by an hiſtorian of no mean credit, who relates, that the Tyrians would have ſettled a colony on the newly-diſcovered iſland, but were oppoſed by the Carthaginians, for ſtate reaſons. The following paſſage has been quoted, likewiſe, from Seneca's *Medea*, in confirmation of this notion.

——*Venient annis*
Sæcula ſeris, quibus oceanus
Vincula rerum laxet, & ingens
Pateat tellus, Typhiſque novos
Delegat orbes: nec ſit terris
Ultima Thule.——

Act. iii. ver. 375.

111
Pretenſions of the Welſh to the diſcovery of America, in the 12th century.

The Welſh, fondly, imagine that their country contributed, in 1170, to people the New-World, by the adventure of Madoc, ſon of Owen Gwynedd, who, on the death of his father, ſailed there, and colonized part of the country. It is pretended that Madoc made two voyages: that ſailing weſt, he left Ireland ſo far to the north, that he came to a land unknown, where he ſaw many ſtrange things; that he returned home, and, making a report of the fertility of the newly-diſcovered country, prevailed on numbers of the Welſh, of each ſex, to accompany him, on a ſecond voyage, from which he never returned. The favourers of this opinion aſſert, that ſeveral Welſh words, ſuch as *gwrando*, "to hearken, or liſten;" the iſle of *Croeſo*, or "welcome;" *Cape-Breton*, from the name of the Britiſh-iſland; *gwynndwr*, or "the white water;" and *pingwin*, or "the bird with a white head;" are to be found in the American language. But likeneſs of ſound, in a few words, will not be deemed ſufficient to eſtabliſh the fact; eſpecially if the meaning has been evidently perverted: for example, the whole pinguin tribe have, unfortunately, not only black heads, but are not inhabitants of the northern hemiſphere; the name was alſo beſtowed on them by the Dutch, *a pinguedine*, from their exceſſive fatneſs. It may be added, that the Welſh were never a naval people; that the age in which Madoc lived was peculiarly ignorant in navigation; and the moſt which they could have attempted muſt have been a mere coaſting voyage.

112
Thoſe of the Norwegians better founded.

The Norwegians put in for a ſhare of the glory, on grounds rather better than the Welſh. By their ſettlements in Iceland, and in Greenland, they had arrived within ſo ſmall a diſtance of the New-World, that there is a probability of its having been touched at by a people ſo verſed in maritime affairs, and ſo adventurous, as the ancient Nortmans were. The proofs are much more numerous than thoſe produced by the Britiſh hiſtorians; for the diſcovery is mentioned in ſeveral of the Icelandic manuſcripts. The period was about the year 1002, when it was viſited by one Biorn; and the diſcovery purſued to greater effect by Leif, the ſon of Eric, the diſcoverer of Greenland. It does not appear that they reached farther than Labrador; on which coaſt they met with Eſquimaux, on whom they beſtowed the name of *Skrælingues*, or dwarfiſh people, from their ſmall ſtature. They were armed with bows and arrows, and had leathern canoes, ſuch as they have at preſent. All this is probable; nor ſhould the tale of the German, called *Turkil*, one of the crew, invalidate the account. He was, one day, miſſing; but ſoon returned, leaping and ſinging, with all the extravagant marks of joy a *bon vivant* could ſhow, on diſcovering the inebriating fruit of his country, the grape: Torfæus even ſays, that he returned in a ſtate of intoxication. To convince his commander, he brought ſeveral bunches: and the country, from that circumſtance, was named *Vinland*. There appears no reaſon to doubt of the diſcovery; it is thought probable, however, that theſe people reached no farther than the barren country of Labrador. In ſhort, it is from a much later period that we muſt date the *unequivocal* diſcovery of America.

113
The projects of Chriſtopher Columbus.

Towards the cloſe of the 15th century, Venice and Genoa being rivals in commerce, in which the former had greatly the ſuperiority, Chriſtopher Colon, or Columbus, a native of Genoa, conceived a project of ſailing to the Eaſt-Indies by directing his courſe weſtward. This deſign was founded upon a miſtake of the geographers, of thoſe days, who placed the eaſtern parts of Aſia immenſely too far to the eaſtward; ſo that had they been in the right, the ſhorteſt way would have been to ſail directly weſtward. Columbus applied, firſt, to his own countrymen; but being rejected by them, he applied to Portugal, where he met with no better ſucceſs. Spain was his next reſource: here, after eight years attendance, he obtained, in 1492, a fleet of three ſhips. The largeſt, a ſhip of no conſiderable burden, was commanded by Columbus, as admiral, who gave it the name of *Santa Maria*, out of reſpect for the Bleſſed Virgin, whom he honoured with ſingular devotion. Of the ſecond, called the *Pinta*, Martin Pinzon was captain, and his brother Francis pilot. The third, named the *Nigna*, was under the command of Vincent Yanez Pinzon. Theſe two were light veſſels, hardly ſuperior in burden, or force, to large boats. This ſquadron, if it merits that name, was victualled for 12 months, and had on board 90 men, moſtly ſailors, together with a few adventurers, who followed the fortune of Columbus, and ſome gentlemen of Iſabella's court, whom ſhe appointed to accompany him. Though the expence of the undertaking was one of the circumſtances which chiefly alarmed the court of Spain, and retarded, ſo long, the negociation with Columbus, the ſum employed in fitting out this ſquadron did not exceed 4000l. As Columbus was deeply impreſſed with ſentiments of religion, he would not ſet out upon an expedition ſo arduous, and of which one great object was to extend the knowledge of the Chriſtian faith, without imploring, publicly, the guidance and protection of Heaven. With this view, he, together with all the perſons under his command, marched, in ſolemn proceſſion, to the monaſtery of Rabida. After confeſſing their ſins, and obtaining abſolution, they received the holy ſacrament from the hands of the guardian, who joined his prayers to theirs for the ſucceſs of an enterpriſe which he had ſo zealouſly patronized.

114
His voyage

Next morning, being Friday, the third day of Auguſt, in the year 1492, Columbus ſet ſail, a little before ſun-riſe, in preſence of a vaſt crowd of ſpectators, who ſent up their ſupplications to Heaven for the proſperous iſſue of the voyage, which they wiſhed, rather than expected. Columbus ſteered, directly, for the Canary-Iſlands, and arrived there without any occurrence that would have deſerved notice on any other occaſion: but, in a voyage of ſuch expectation and importance, every circumſtance was the object of attention. The rudder of the Pinta broke looſe, the day after ſhe left the harbour, and that accident alarmed the crew, no leſs ſuperſtitious than unſkilful, as a certain omen of the unfortunate deſtiny of the expedition. Even in the ſhort run to the Canaries, the ſhips were found to be ſo crazy, and ill appointed, as to be very improper for a navigation which was expected to be both long and dangerous. Columbus refitted them, however, to the beſt of his power; and having ſupplied himſelf with freſh proviſions, he took his departure from Gomera, one of the moſt weſterly of the Canary-Iſlands, on the ſixth day of September.

Here the voyage of diſcovery may properly be ſaid to begin; for Columbus, holding his courſe due weſt, left, immediately, the uſual track of navigation, and ſtretched into unfrequented and unknown ſeas. The firſt day, as it was very calm, he made but little way; but on the ſecond he loſt ſight of the Canaries; and many of the ſailors, already dejected and diſmayed, when they contemplated the boldneſs of the undertaking, began to beat their breaſts, and to ſhed tears, as if they were never more to behold land. Columbus comforted them with aſſurances of ſucceſs, and the proſpect of vaſt wealth, in thoſe opulent regions whither he was conducting them. He regulated every thing by his ſole authority; he ſuperintended the execution of every order; and, allowing himſelf only a few hours for ſleep, he was at all other times upon deck. As his courſe lay through ſeas which had not, formerly, been viſited, the ſounding-line, or inſtruments for obſervation, were continually in his hands. After the example of the Portugueſe diſcoverers, he attended to the motion of tides and currents, watched the flight of birds, the appearance of fiſhes, of ſea-weeds, and of every thing that floated on the waves, and entered every occurrence, with a minute exactneſs, in the journal which he kept. As the length of the voyage could not fail of alarming ſailors habituated only to ſhort excurſions, Columbus endeavoured to conceal from them the real progreſs which they made. With this view, though they ran 18 leagues the ſecond day, after they left Gomera, he gave out that they had advanced only 15, and he, uniformly, employed the ſame artifice of reckoning ſhort, during the whole voyage. By the 14th of September, the fleet was above 200 leagues to the weſt of the Canary-Iſles. There they were ſtruck with an appearance, no leſs aſtoniſhing than new. They obſerved that the magnetic needle, in their compaſſes, did not point exactly to the polar ſtar, but varied towards the weſt; and, as they proceeded, this variation increaſed. This appearance, which is now familiar, though it ſtill remains one of the myſteries of nature, into the cauſe of which the ſagacity of man hath not been able to penetrate, filled the companions of Columbus with terror. They were now in a boundleſs, unknown, ocean, far from the uſual courſe of navigation; nature itſelf ſeemed to be altered, and the only guide which they had left was about to fail them. Columbus, with no leſs quickneſs than ingenuity, invented a reaſon for this appearance, which, though it did not ſatisfy himſelf, ſeemed ſo plauſible to them, that it diſpelled their fears, or ſilenced their murmurs.

115
Aſtoniſhment occaſioned by obſerving the variation of the compaſs.

He ſtill continued to ſteer due weſt, nearly in the ſame latitude with the Canary-Iſlands. In this courſe, he came within the ſphere of the trade-wind, which blows, invariably, from eaſt to weſt, between the tropics, and a few degrees beyond them. He advanced before this ſteady gale with ſuch uniform rapidity, that it was ſeldom neceſſary to ſhift a ſail. When about 400 leagues to the weſt of the Canaries, he found the ſea ſo covered with weeds, that it reſembled a meadow of vaſt extent; and in ſome places they were ſo thick, as to retard the motion of the veſſels. This ſtrange appearance occaſioned new alarm and diſquiet. The ſailors imagined that they were now arrived at the utmoſt boundary of the navigable ocean; that theſe floating weeds would obſtruct their farther progreſs, and concealed dangerous rocks, or ſome large tract of land, which had ſunk, they knew not how, in that place. Columbus endeavoured to perſuade them, that what had alarmed, ought rather to have encouraged them, and was to be conſidered as a ſign of approaching land. At the ſame time, a briſk gale aroſe, and carried them forward. Several birds were ſeen hovering about the ſhip, and directed their flight towards the weſt. The deſponding crew reſumed ſome degree of ſpirit, and began to entertain freſh hopes.

Upon the firſt of October they were, according to the admiral's reckoning, 770 leagues to the weſt of the Canaries; but, leſt his men ſhould be intimidated by the prodigious length of the navigation, he gave out that they had proceeded only 584 leagues; and, fortunately for Columbus, neither his own pilot, nor thoſe of the other ſhips, had ſkill ſufficient to correct this error, and to diſcover the deceit. They had, now, been above three weeks at ſea: they had proceeded far beyond what former navigators had attempted, or deemed poſſible: all their prognoſtics of diſcovery, drawn from the flight of birds, and other circumſtances, had proved fallacious: the appearances of land, with which their own credulity, or the artifice of their commander, had, from time to time, flattered and amuſed them, had been altogether illuſive, and their proſpect of ſucceſs ſeemed now to be as diſtant as ever. Theſe reflections occurred often to men, who had no other object, or occupation, than to reaſon and to diſcourſe concerning the intention and circumſtances of their expedition. They made impreſſion, at firſt, upon the ignorant and timid, and extending, by degrees, to ſuch as were better informed, or more reſolute, the contagion ſpread, at length, from ſhip to ſhip. From ſecret whiſpers and murmurings, they proceeded to open cabals and public complaints.

plaints. They taxed their ſovereign with inconſiderate credulity, in paying ſuch regard to the vain promiſes and raſh conjectures of an indigent foreigner, as to hazard the lives of ſo many of her own ſubjects, in proſecuting a chimerical ſcheme. They affirmed that they had fully performed their duty, by venturing ſo far in an unknown and hopeleſs courſe, and could incur no blame, for refuſing to follow, any longer, a deſperate adventurer to certain deſtruction. They contended, that it was neceſſary to think of returning to Spain, while their crazy veſſels were ſtill in a condition to keep the ſea, but expreſſed their fears that the attempt would prove vain, as the wind, which had hitherto been ſo favourable to their courſe, muſt render it impoſſible to ſail in the oppoſite direction. All agreed that Columbus ſhould be compelled by force to adopt a meaſure on which their common ſafety depended. Some of the more audacious propoſed, as the moſt expeditious and certain method for getting rid, at once, of his remonſtrances, to throw him into the ſea; being perſuaded that, upon their return to Spain, the death of an unſucceſsful projector would excite little concern, and be inquired into with no curioſity.

116
Perilous ſituation of Columbus.

Columbus was fully ſenſible of his perilous ſituation. He had obſerved, with great uneaſineſs, the fatal operation of ignorance, and of fear, in producing diſaffection, among his crew; and ſaw that it was now ready to burſt out into open mutiny. He retained, however, perfect preſence of mind. He affected to ſeem ignorant of their machinations. Notwithſtanding the agitation and ſolicitude of his own mind, he appeared with a chearful countenance; like a man ſatisfied with the progreſs which he had made, and confident of ſucceſs. Sometimes he employed all the arts of inſinuation to ſoothe his men. Sometimes he endeavoured to work upon their ambition, or avarice, by magnificent deſcriptions of the fame and wealth which they were about to acquire. On other occaſions, he aſſumed a tone of authority, and threatened them with vengeance from their ſovereign, if, by their daſtardly behaviour, they ſhould defeat this noble effort to promote the glory of God, and to exalt the Spaniſh name, above that of every other nation. Even with ſeditious ſailors, the words of a man, whom they had been accuſtomed to reverence, were weighty and perſuaſive; and not only reſtrained them from thoſe violent exceſſes which they meditated, but prevailed with them to accompany their admiral for ſome time longer.

117
His crew ready to mutiny.

As they proceeded, the indications of approaching land ſeemed to be more certain, and excited hope in proportion. The birds began to appear in flocks making towards the ſouth-weſt. Columbus, in imitation of the Portugueſe navigators, who had been guided in ſeveral of their diſcoveries by the motion of birds, altered his courſe from due weſt towards that quarter whither they pointed their flight. But after holding on for ſeveral days in this new direction without any better ſucceſs than formerly, having ſeen no object during 30 days but the ſea and the ſky, the hopes of his companions ſubſided faſter than they had riſen; their fears revived with additional force; impatience, rage, and deſpair, appeared in every countenance. All ſenſe of ſubordination was loſt. The officers, who had hitherto concurred with Columbus in opinion, and ſupported his authority, now took part with the private men: they aſſembled, tumultuouſly, on the deck, expoſtulated with their commander, mingled threats with their expoſtulations, and required him inſtantly to tack about, and to return to Europe. Columbus perceived that it would be of no avail to have recourſe to any of his former arts, which having been tried ſo often had loſt their effect; and that it was impoſſible to rekindle any zeal for the ſucceſs of the expedition among men in whoſe breaſts fear had extinguiſhed every generous ſentiment. He ſaw that it was no leſs vain to think of employing either gentle or ſevere meaſures, to quell a mutiny ſo general and ſo violent. It was neceſſary, on all theſe accounts, to ſoothe paſſions which he could no longer command, and to give way to a torrent too impetuous to be checked. He promiſed, ſolemnly, to his men, that he would comply with their requeſt, provided they would accompany him, and obey his commands for three days longer; and if, during that time, land were not diſcovered, he would then abandon the enterpriſe and direct his courſe towards Spain.

Enraged as the ſailors were, and impatient to turn their faces again towards their native country, this propoſition did not appear to them unreaſonable. Nor did Columbus hazard much in confining himſelf to a term ſo ſhort. The preſages of diſcovering land were now ſo numerous and promiſing, that he deemed them infallible. For ſome days, the ſounding line had reached the bottom, and the ſoil which it brought up indicated land to be at no great diſtance. The flocks of birds increaſed; and were compoſed not only of ſea fowl, but of ſuch land-birds as could not be ſuppoſed to fly far from the ſhore. The crew of the Pinta obſerved a cane floating which ſeemed to be newly cut, and likewiſe a piece of timber artificially carved. The ſailors aboard the Nigna took up the branch of a tree, with red berries, perfectly freſh. The clouds around the ſetting ſun aſſumed a new appearance; the air was more mild and warm; and, during night, the wind became unequal and variable. From all theſe ſymptoms, Columbus was ſo confident of being near land, that, on the evening of the 11th of October, after public prayers for ſucceſs, he ordered the ſails to be furled and the ſhips to lie by, keeping ſtrict watch, leſt they ſhould be driven aſhore in the night. During this interval of ſuſpence and expectation, no man ſhut his eyes, all kept upon deck, gazing intently towards that quarter where they expected to diſcover the land which had been ſo long the object of their wiſhes.

118
Their joy on deſcrying land.

About two hours before midnight, Columbus ſtanding on the forecaſtle, obſerved a light at a diſtance, and privately pointed it out to Pedro Guttierez, a page of the queen's wardrobe. Guttierez perceived it; and calling to Salcedo, comptroller of the fleet, all three ſaw it in motion, as if it were carried from place to place. A little after midnight, the joyful ſound of *Land! land!* was heard from the Pinta, which kept always a-head of the other ſhips. But having been ſo often deceived by fallacious appearances, every man was now become ſlow of belief; and waited, in all the anguiſh of uncertainty and impatience, for the return of day. As ſoon as morning dawned, all doubts and fears were diſpelled. From each ſhip, an iſland was ſeen about two leagues to the north, whoſe flat and verdant fields, well ſtored with wood, and watered with many rivulets, preſented the aſpect of a delightful country. The crew of the Pinta inſtantly began the *Te Deum*, as a hymn of thankſgiving to God; and were joined by thoſe of the other ſhips, with tears of joy and tranſports of congratulation. This office of gratitude to Heaven was followed by an act of juſtice to their commander. They threw themſelves at the feet of Columbus, with feelings of ſelf-condemnation mingled with reverence. They implored him to pardon their ignorance, incredulity, and inſolence, which had created him ſo much unneceſſary diſquiet, and had ſo often obſtructed the proſecution of his well-concerted plan; and paſſing, in the warmth of their admiration, from one extreme to another, they now pronounced the man whom they had ſo lately reviled, and threatened, to be a perſon inſpired by Heaven, with ſagacity and fortitude more than human, in order to accompliſh a deſign ſo far beyond the ideas and conception of all former ages.

119
They land in one of the iſlands of the New-World.

As ſoon as the ſun aroſe, all their boats were manned and armed. They rowed towards the iſland with their colours diſplayed, with warlike muſick, and other martial pomp. As they approached the coaſt, they ſaw it covered with a multitude of people, whom the novelty of the ſpectacle had drawn together, whoſe attitudes and geſtures expreſſed wonder and aſtoniſhment, at the ſtrange objects which preſented themſelves to their view. Columbus was the firſt European who ſet foot in the New-World, which he had diſcovered. He landed in a rich dreſs, and with a naked ſword in his hand. His men followed; and, kneeling down, they all kiſſed the ground which they had ſo long deſired to ſee. They, next, erected a crucifix; and, proſtrating themſelves before it, returned thanks to God for conducting their voyage to ſuch an happy iſſue.

120
The continent afterwards diſcovered.

The above was one of the Bahama-Iſlands; to which he gave the name of *San Salvador*, and took poſſeſſion of it, in the name of their Catholic majeſties. In this firſt voyage he diſcovered ſeveral other of the Lucayo, or Bahama-Iſlands, with thoſe of Cuba and Hiſpaniola. The natives conſidered the Spaniards as divinities, and the diſcharge of the artillery as their thunder: they fell proſtrate at the ſound. The women, however, offered their favours, and courted the embraces of their new gueſts as men. Their huſbands were not jealous of them; and in the arms of thoſe wantons the companions of Columbus are ſaid, by ſome authors, to have caught that malady which directs its poiſon to the ſprings of life. In a ſecond voyage, many new iſlands were diſcovered. In a third, he attained the great object of his ambition, by diſcovering the continent of America, near the mouth of the river Oroonoko, on the firſt day of Auguſt 1498. His ſucceſs produced a crowd of adventurers, from all nations; but the year before this, the northern continent had been diſcovered by Sebaſtian Cabot, in the ſervice of Henry VII. of England.

121
Diviſion of America.

Notwithſtanding the many ſettlements of the Europeans in this continent, great part of America remains ſtill unknown. The northern continent contains the Britiſh colonies of Hudſon's-Bay, Canada, and Nova-Scotia; the New-England ſtates, New-York, New-Jerſey, Pennſylvania, Maryland, Virginia, North, and South, Carolina, and Georgia. It contains, alſo, the Spaniſh territories of Eaſt, and Weſt, Florida, Louiſiana, New-Mexico, California, and Mexico. Beſides theſe, there are immenſe regions to the weſt, and north, the boundaries of which have never yet been diſcovered. In ſuch as are in any degree known, dwell the Eſquimaux, the Algonquins, the Hurons, the Iroquois, the Cheerake, the Chickaſaws, and many other tribes of Indians. In the ſouthern continent lie the Spaniſh provinces of Tierra-Firmé, Guiana, Peru, Paraguay, and Chili; together with that of Braſil, belonging to the Portugueſe; and the country of Surinam, belonging to the Dutch. Vaſt tracts, however, in the inland parts, are unknown, being comprehended under the general name of *Amazonia.* A large diſtrict, alſo, ſaid to be the reſidence of a gigantic race of men, lies on the eaſt ſide of the continent, between the ſtraits of Magellan and the province of Paraguay. See the article PATAGONIA.

122
Its productions.

This vaſt country produces many of the metals, minerals, plants, fruits, trees, and wood, to be met with in the other parts of the world, and many of them in greater quantities, and in high perfection. The gold and ſilver of America have ſupplied Europe with ſuch immenſe quantities of thoſe valuable metals, that they are become vaſtly more common; ſo that the gold and ſilver of Europe now bear little proportion to the high price ſet upon them before the diſcovery of America.

It alſo produces diamonds, pearls, emeralds, amethyſts, and other valuable ſtones, which, by being brought into Europe, have contributed, likewiſe, to lower their value. To theſe, which are chiefly the productions of Spaniſh-America, may be added a great number of other commodities, which, though of leſs price, are of much greater uſe. Of theſe are the plentiful ſupplies of cochineal, indigo, anatto, logwood, brazil, fuſtic, pimento, lignum vitæ, rice, ginger, cocoa, or the chocolate-nut, ſugar, cotton, tobacco, banillas, red-wood, the balſams of Tolu, Peru, and Chili, that valuable article, in medicine, the Jeſuit's bark, mechoacan, ſaſſafras, ſarſaparilla, caſſia, tamarinds, hides, furs, ambergriſe, and a great variety of woods, roots, and plants; to which, before the diſcovery of America, the Europeans were either entire ſtrangers, or which they were forced to buy at an extravagant rate from Aſia and Africa, through the hands of the Venetians and Genoeſe, who then engroſſed the trade of the Eaſtern-World.

On this continent there grows alſo a variety of excellent native fruits; as pine-apples, citrons, lemons, oranges, malicatons, figs, grapes, great numbers of culinary, medicinal, and other herbs, roots, and plants, with many exotic productions, which are nouriſhed in as great perfection as in their native ſoil.

123
The different poſſeſſors of America.

Although the Indians ſtill live in the quiet poſſeſſion of many large tracts, America, ſo far as known, is chiefly claimed, and divided into colonies, by three European nations, the Spaniards, Engliſh, and Portugueſe. The Spaniards, as they firſt diſcovered it, have the largeſt and richeſt portion, extending from New-Mexico and Louiſiana, in North-America, to the Straits of Magellan, in the South-Sea, excepting the large province of Braſil, which belongs to Portugal; for though the French and Dutch have ſome forts upon Surinam and Guiana, they ſcarcely deſerve to be conſidered as proprietors of any part of the ſouthern continent.

Next to Spain, the moſt conſiderable proprietor of America was Great Britain, who derived her claim to North-America from the firſt diſcovery of that continent by Sebaſtian Cabot, in the name of Henry VII.

anno 1497, about ſix years after the diſcovery of South-America by Columbus, in the name of the king of Spain. This country was in general called *Newfoundland;* a name which is now appropriated ſolely to an iſland upon its coaſt. It was a long time before the Engliſh made any attempt to ſettle in this country. Sir Walter Raleigh, an uncommon genius and a brave commander, firſt ſhowed the way, by planting a colony in the ſouthern part, which he called *Virginia,* in honour of his virgin miſtreſs Queen Elizabeth.

124
Vaſt extent of the Britiſh poſſeſſions before the late revolution.

The French indeed, from this period until the concluſion of the war before laſt, laid a claim to, and actually poſſeſſed, Canada, and Louiſiana; comprehending all that extenſive inland country reaching from Hudſon's-Bay, on the north, to Mexico and the gulph of the ſame name, on the ſouth. But, in that war, they were not only driven from Canada and its dependencies, but obliged to relinquiſh all that part of Louiſiana lying on the eaſt ſide of the Miſſiſſippi, as related under the *Hiſtory of* BRITAIN. And thus the Britiſh colonies were preſerved, ſecured, and extended ſo far, as to render it difficult to aſcertain the preciſe bounds of empire in North America. To the northward they might have extended their claims quite to the pole itſelf, nor did any nation ſeem inclined to diſpute the property of this northernmoſt country with them. From that extremity they had a territory extending, ſouthward, to Cape Florida in the Gulph of Mexico, N. Lat. 25°, and conſequently near 4000 miles long in a direct line. And to the weſtward, their boundaries reached to nations unknown even to the Indians of Canada.

Of the revolution that has ſince taken place, by which a great part of thoſe territories has been torn from the Britiſh empire, the hiſtory follows in the next article.

125
Riſe of the American republic.

AMERICA (United States of). Of the riſe and eſtabliſhment of this republic, which has given a new face to the weſtern world, a ſuccinct and impartial narrative ſhall in this article be attempted; in which, however, we cannot hope entirely to avoid errors, as they are perhaps unavoidable. The accounts from which the hiſtorian muſt derive his information are not yet cleared from the miſtakes of prejudice and the fabrications of party; when they differ, their comparative authenticity is with difficulty aſcertained; and they want, above all, that ſoftening which they can receive from time alone.

It has hitherto been remarked, that the beginning of every political eſtabliſhment is contemptible. Some few banditti, taking refuge among the marſhes on the banks of the Tiber, laid the foundation of the Roman empire: and it may, perhaps, be ſaid, that the turbulence of ſome North Americans, and the blunders of ſome Britiſh ſtateſmen, gave birth to this new republic, which, at a future period, bids fair to ſurpaſs even the ſplendor of Rome.

126
State and haracter f the Bri- ſh colonies t the end f the war 763.

The ſtate of the Britiſh colonies at the concluſion of the war in 1763, was ſuch as attracted the attention of all the politicians in Europe. Their flouriſhing condition at that period was remarkable and ſtriking: their trade had proſpered in the midſt of all the difficulties and diſtreſſes of a war in which they were ſo nearly and ſo immediately concerned. Their population continued on the increaſe, notwithſtanding the ravages and depredations that had been ſo fiercely carried on by the French, and the native Indians in their alliance. They abounded with ſpirited and active individuals of all denominations. They were fluſhed with the uncommon proſperity that had attended them in their commercial affairs and military tranſactions. Hence they were ready for all kind of undertakings, and ſaw no limits to their hopes and expectations.

As they entertained the higheſt opinion of their value and importance, and of the immenſe benefit that Britain derived from its connection with them, their notions were adequately high in their own favour. They deemed themſelves, not without reaſon, entitled to every kindneſs and indulgence which the mother-country could beſtow.

Although their pretenſions did not amount to a perfect equality of advantages and privileges in matters of commerce, yet in thoſe of government they thought themſelves fully competent to the taſk of conducting their domeſtic concerns, with little or no interference from abroad. Though willing to admit the ſupremacy of Great Britain, they viewed it with a ſuſpicious eye, and with a marked deſire to reſtrain it within its ſtrict conſtitutional boundaries.

Their improvements in all the neceſſary and uſeful arts did honour to their induſtry and ingenuity. Though they did not live in the luxury of Europe, they had all the ſolid and ſubſtantial enjoyments of life, and were not unacquainted with many of its elegancies and refinements.

A circumſtance much to their praiſe is, that, notwithſtanding their peculiar addiction to thoſe occupations of which lucre is the ſole object, they were duly attentive to cultivate the field of learning; and they have, ever ſince their firſt foundation, been particularly careful to provide for the education of the riſing progeny.

Their vaſt augmentation of internal trade and external commerce, was not merely owing to their poſition and facility of communication with other parts; it aroſe alſo from their natural turn and temper, full of ſchemes and projects; ever aiming at new diſcoveries, and continually employed in the ſearch of means of improving their condition.

Their condition carried them into every quarter from whence profit could be derived. There was ſcarcely any port of the American hemiſphere to which they had not extended their navigation. They were continually exploring new ſources of trade, and were found in every ſpot where buſineſs could be tranſacted.

To this extenſive and inceſſant application to commerce, they added an equal vigilance in the adminiſtration of their affairs at home. Whatever could conduce to the amelioration of the ſoil they poſſeſſed, to the progreſs of agriculture, or to the improvement of their domeſtic circumſtances, was attended to with ſo much labour and care, that it may be ſtrictly ſaid, that Nature had given them nothing of which they did not make the moſt.

In the midſt of this ſolicitude and toil in matters of buſineſs, the affairs of government were conducted with ſteadineſs, prudence, and lenity, ſeldom experienced, and never exceeded, in the beſt regulated countries of Europe.

Such was the ſituation of the Britiſh colonies in general throughout North America, and of the New-England provinces in particular, when the pacification above-mentioned opened one of the moſt remarkable ſcenes that ever commanded the attention of the world.

127
Intrigues of the French, ſuppoſed by Engliſh writers to be the origin of the American war.

In treating of the American revolution, it has become a faſhion with the Engliſh writers to aſcribe that event to the ſucceſsful intrigues of the French government. Inſtead of contemplating it, with the characteriſtic philoſophy of their country, as the reſult of a conteſt between the deſire of power, and the abhorrence of oppreſſion, they have ſought the origin of the evil in any ſource rather than their own miſconduct; and have endeavoured, at once, to huſh the reproaches of their political conſcience, and to gratify the cravings of their national animoſity, in wild conjectures of a ſcheme formed by their neighbours to divide the Britiſh Empire, and in declamatory invectives againſt the Gallic faith and honour. Thus, it has been repeatedly aſſerted, that the French having long viewed, with equal envy and apprehenſion, the flouriſhing ſtate of the colonies which Britain had founded in America, began immediately after the peace of Paris to carry into execution their project for ſeparating thoſe colonies from the mother country. Secret emiſſaries, it is ſaid, were employed in ſpreading diſſatiſfaction among the coloniſts; and the effects produced by theſe machinating ſpirits are deſcribed to have been a rapid diminution of that peculiar warmth of attachment, which the inhabitants of North-America had hitherto demonſtrated for the mother country; the excitement of a jealouſy which led them to view her rather in the light of a ſovereign than of a parent; and the introduction of a hoſtile policy which taught them to examine, with a ſcrupulous nicety, the nature of thoſe ties that rendered them parts of her empire. That ſuch emiſſaries were ever employed, is a fact unſupported by any document which the purity of hiſtorical truth can admit; and, although the effects here deſcribed, have certainly appeared, it muſt be remembered that their appearance followed, but did not precede, the attempts of Britain upon the rights and liberties of America. By mere artifice and addreſs to have alienated the affections of the coloniſts from their mother country, at the cloſe of a war, in which their intereſts and feelings had been interwoven with more than uſual ſtrength and energy, was a taſk of infinite difficulty; not ſurely to be accompliſhed in the ſhort period between the declaration of peace in 1761, and the promulgation of the firſt obnoxious acts of the Britiſh parliament in 1764. But, if we trace theſe effects to another cauſe, to a love of liberty and a quick ſenſe of injury, their appearance will be natural and juſt; conſiſtent with the American character, and correſponding with the conduct which was diſplayed in all the viciſſitudes that attended the revolt.

128
Taxes laid on goods imported into the colonies, and other obnoxious acts framed;

In March 1764, a bill was paſſed, by which heavy duties were laid on goods imported by the coloniſts from ſuch Weſt India iſlands as did not belong to Great Britain; at the ſame time that theſe duties were to be paid into the exchequer in ſpecie: and in the ſame ſeſſion, another bill was framed to reſtrain the currency of paper-money in the colonies themſelves. Not only the principle of taxation, but the mode of collection was conſidered as an unconſtitutional and oppreſſive innovation; for the penalties incurred by an infraction of the acts of parliament, might be recovered in the courts of admiralty, before a ſingle judge (whoſe ſalary was the fruit of the forfeitures he decreed) without trial by jury, or any of the other benefits of common law juriſprudence. Theſe acts coming ſo cloſe to each other, threw the whole continent into the utmoſt ferment. Vehement remonſtrances were made to the miniſtry, and every argument made uſe of that reaſon or ingenuity could ſuggeſt, but to no purpoſe. Their reaſoning, however, convinced a great number of people in Britain; and thus the American cauſe came to be conſidered as the cauſe of liberty.

129
Which exaſperate the Americans.

The Americans, finding all argumentation vain, at laſt united in an agreement to import no more of the manufactures of Great Britain, but to encourage to the utmoſt of their power every thing of that kind among themſelves. Thus the Britiſh manufacturers alſo became a party againſt the miniſtry, and did not fail to expreſs their reſentment in the ſtrongeſt terms; but the miniſtry were not to be ſo eaſily daunted, and therefore proceeded to the laſt ſtep of their intended plan, which was to lay on ſtamp duties throughout the continent. Previous to this, indeed, ſeveral regulations were paſſed in favour of the commerce of the colonies; but they had now imbibed ſuch unfavourable ſentiments of the Britiſh miniſtry, that they paid very little regard to any thing pretended to be done in their favour; or if theſe acts made any favourable impreſſion, it was quickly obliterated by the news of the ſtamp-act. The reaſon given for this act, ſo exceedingly obnoxious, was, that a ſum might be raiſed ſufficient for the defence of the colonies againſt a foreign enemy; but this pretence was ſo far from giving any ſatisfaction to the Americans, that it excited their indignation to the utmoſt degree. They not only aſſerted that they were abundantly able to defend themſelves againſt any foreign enemy, but denied that the Britiſh parliament had any right to tax them at all.

130
The ſtamp-act framed.

It would be ſuperfluous to enter into any arguments uſed by the contending parties on this important occaſion. It was evident that the matter was not to be decided by argument, but by force of arms; and the Britiſh miniſtry, too confident of the authority and power of that country, determined to carry on matters with an high hand, to terrify the coloniſts into an implicit ſubjection, or, if that would not do, to compel them to it by force. The ſtamp-act, after a violent oppoſition in parliament, was paſſed, and its reception in America was ſuch as might have been expected. The news, and the act itſelf, firſt arrived at Boſton, where the bells were muffled and rung a funeral peal. The act was firſt hawked about the ſtreets with a Death's head affixed to it, and ſtyled the "Folly of England, and the Ruin of America;" and afterwards publicly burnt by the enraged populace: The ſtamps themſelves were ſeized and deſtroyed, unleſs brought by men of war, or kept in fortified places; thoſe who were to receive the ſtamp duties were compelled to reſign their offices; and ſuch of the Americans as ſided with government on this occaſion, had their houſes plundered and burnt.

131
Received with univerſal indignation in America.

Though theſe outrages were committed by the loweſt of the multitude, they were firſt connived at by thoſe of ſuperior rank, and the principles on which they were founded afterwards openly patronized by them; and the doctrine became general and openly avowed, that Britain had no right whatever to tax the colonies without their own conſent.

It was now found abſolutely neceſſary either to yield to the Americans, by repealing the obnoxious ſtatutes, or to enforce them by arms. The ferment had diffuſed itſelf univerſally throughout the colonies. Virginia firſt, and after that all the reſt of the provinces, declared againſt the right of Britain to lay on taxes in America; and that every attempt to veſt others with this power beſides the king, or the governor of the province and his general aſſembly, was illegal, unconſtitutional, and unjuſt. Non-importation agreements were every where entered into; and it was even reſolved to prevent the ſale of any more Britiſh goods after the preſent year. American manufactures, though dearer, as well as inferior in quality to the Britiſh, were univerſally preferred. An aſſociation was entered into againſt eating of lamb, in order to promote the growth of wool; and the ladies with chearfulneſs agreed to renounce the uſe of every ſpecies of ornament manufactured in Britain. Such a general and alarming confederacy determined the miniſtry to repeal ſome of the moſt obnoxious ſtatutes; and to this they were the more inclined by a petition from the firſt American congreſs, held at New York in the beginning of October 1765.

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epealed.

The ſtamp-act was therefore repealed, to the univerſal joy of the Americans, and indeed to the general ſatisfaction of the Engliſh, whoſe manufactures had begun to ſuffer very ſeverely in conſequence of the American aſſociation againſt them. The diſputes on the ſubject without doors, however, were by no means ſilenced, but each party continued to argue the caſe as violently as ever. The celebrated Dr Benjamin Franklin was, on this occaſion, examined before the Houſe of Commons; and his opinion was in ſubſtance as follows:

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“ That the tax in queſtion was impracticable and ruinous. The very attempt had ſo far alienated the affection of the colonies, that they behaved in a leſs friendly manner towards the natives of England than before; conſidering the whole nation as conſpiring againſt their liberty, and the parliament as willing rather to oppreſs than to ſupport and aſſiſt them. America, in fact, did not ſtand in any need of Britiſh manufactures, having already begun to conſtruct ſuch as might be deemed abſolutely neceſſary, and that with ſuch ſucceſs, as left no doubt of their arriving in a ſhort time at perfection. The elegancies of dreſs had already been renounced for manufactures of the American kind, though much inferior; and the bulk of the people, conſiſting of farmers, were ſuch as could in no way be affected by the want of Britiſh commodities, as having every neceſſary within themſelves. Materials of all kinds were to be had in plenty: the wool was fine; flax grew in great abundance; and iron was every where to be met with.”

The Doctor alſo inſiſted, That “ the Americans had been greatly miſrepreſented; that they had been traduced as void of gratitude and affection to the parent ſtate; than which nothing could be more contrary to truth. In the war of 1755 they had, at their own expence, raiſed an army of 25,000 men; and in that of 1739, they aſſiſted the Britiſh expeditions againſt South-America with ſeveral thouſand men, and had made many brave exertions againſt the French in North-America. It was ſaid that the war of 1755 had been undertaken in defence of the colonies; but the truth was, that it originated from a conteſt about the limits between Canada and Nova-Scotia, and in defence of the Engliſh rights to trade on the Ohio. The Americans, however, would ſtill continue to act with their uſual fidelity; and, were any war to break out in which they had no concern, they would ſhow themſelves as ready as ever to aſſiſt the parent ſtate to the utmoſt of their power, and would never fail to manifeſt their readineſs in contributing to the emergencies of government, when called to do ſo in a regular and conſtitutional manner.”

134
Declaratory bill gives offence in America.

The miniſtry were conſcious, that in repealing this obnoxious act, they yielded to the Americans; and therefore, to ſupport, as they thought, the dignity of Great Britain, it was judged proper to publiſh a declaratory bill, ſetting forth the authority of the mother-country over her colonies, and her power to bind them by laws and ſtatutes *in all caſes whatever*. This much diminiſhed the joy with which the repeal of the ſtamp-act was received in America. It was conſidered as a proper reaſon to enforce any claims equally prejudicial with the ſtamp-act, which might hereafter be ſet up; a ſpirit of jealouſy pervaded the whole continent, and a ſtrong party was formed, watchful on every occaſion to guard againſt the ſuppoſed encroachments of the Britiſh power.

135
Aſſembly of New-York diſobeys an act of parliament.

It was not long before an occaſion offered, in which the Americans manifeſted a ſpirit of abſolute independency; and that, inſtead of being bound by the Britiſh legiſlature in all caſes, they would not be controuled by it in the moſt trivial affairs. The Rockingham miniſtry had paſſed an act, providing the troops ſtationed in different parts of the colonies with ſuch accommodations as were neceſſary for them. The aſſembly of New York, however, took upon them to alter the mode of execution preſcribed by the act of parliament, and to ſubſtitute one of their own. This gave very great offence to the new miniſtry, and rendered them, though compoſed of thoſe who had been active againſt the ſtamp-bill, leſs favourable to the colonies than in all probability they would have otherwiſe been. An unlucky circumſtance at the ſame time occurred, which threw every thing once more into confuſion. One of the new miniſtry, Mr Charles Townſhend, having declared that he could find a way of taxing the Americans without giving them offence, was called upon to propoſe his plan. This was by impoſing a duty upon tea, paper, painters colours, and glaſs imported into America. The conduct of the New-York aſſembly, reſpecting the troops, and that of Boſton, which had proceeded in a ſimilar manner, cauſed this bill to meet with leſs oppoſition than otherwiſe it might have done. As a puniſhment to the refractory aſſemblies, the legiſlative power was taken from that of New-York, until it ſhould fully comply with the terms of the act. That of Boſton at laſt ſubmitted with reluctance. The bill for the new taxes was quickly paſſed, and ſent to America in 1768.

136
Mr Townſhend's plan to tax America.

137
Is received there with ſtill greater indignation than even the ſtamp-act.

A ferment much greater than that occaſioned by the ſtamp-act now took place throughout the continent. The populace renewed their outrages, and thoſe of ſuperior ſtation entered into regular combinations againſt it. Circular letters were ſent from Maſſachuſetts colony to all the reſt, ſetting forth the injuſtice and impropriety of the behaviour of the Britiſh legiſlature. Meetings were held in all the principal towns, in which it was propoſed to leſſen the conſumption of foreign manufactures, by giving proper encouragement to their own.

138
Quarrel between the people of Maſſachuſetts-Bay and their governor.

Continual diſputes enſued betwixt the governors and general aſſemblies of their provinces, which were much heightened by a letter from Lord Shelburne to governor Bamand of Maſſachuſetts-Bay, containing complaints of the people he governed. The aſſembly, exaſperated to the higheſt degree, charged their governor with having miſrepreſented them to the court of Britain, required him to produce copies of the letters he had ſent; and, on his refuſal, wrote letters to the Engliſh miniſtry, accuſing him of miſrepreſentation and partiality, complaining at the ſame time moſt grievouſly of the proceedings of parliament, as utterly ſubverſive of the liberties of America, and the rights of Britiſh ſubjects.

The governor, at a loſs how to defend himſelf, prorogued the aſſembly; and, in his ſpeech on the occaſion, gave a looſe to his reſentment, accuſing the members of ambitious deſigns, incompatible with thoſe of dutiful and loyal ſubjects. To counteract the circular letter of the province of Maſſachuſetts-Bay, Lord Hillſborough, ſecretary for the American department, ſent another to the governors of the different colonies, reprobating the other as full of miſrepreſentation, and tending to excite a rebellion againſt the authority of the parent ſtate.

Matters now haſtened to a criſis. The governor had been ordered to proceed with vigour, and by no means to ſhow any diſpoſition to yield to the people as formerly.

139
He requires the aſſembly to reſcind their circular letter;

In particular, they were required to reſcind that reſolution by which they had written the circular letter above mentioned; and, in caſe of a refuſal, it was told them that they would be diſſolved. As this letter had been framed by the reſolutions of a former Houſe, they deſired, after a week's conſultation, that a receſs might be granted to conſult with their conſtituents; but this being refuſed, they came to a determination, 92 againſt 17, to adhere to the reſolution which produced the circular letter.

Which they refuſe.

At the ſame time a letter was ſent to Lord Hillſborough, and a meſſage to the governor, in juſtification of their proceedings. In both they expreſſed themſelves with ſuch freedom as was by no means calculated to accord with the ſentiments of thoſe in power. They inſiſted that they had a right to communicate their ſentiments to their fellow-ſubjects upon matters of ſuch importance; complained of the requiſition to reſcind the circular letter as unconſtitutional and unjuſt; and particularly inſiſted, that they were repreſented as harbouring ſeditious deſigns, when they were doing nothing but what was lawful and right.

140
Accuſe their governor, and petition for his removal.

At the ſame time they condemned the late acts of parliament as highly oppreſſive, and ſubverſive of liberty. The whole was concluded by a liſt of accuſations againſt their governor, repreſenting him as unfit to continue in his ſtation, and petitioning the king for his removal from it.

141
A tumult at Boſton.

Theſe proceedings were followed by a violent tumult at Boſton. A veſſel belonging to a capital trader had been ſeized in conſequence of his having neglected ſome of the new regulations; and being taken under the protection of a man of war at that time lying in the harbour, the populace attacked the houſes of the commiſſioners of exciſe, broke their windows, deſtroyed the collector's boats, and obliged the cuſtomhouſe officers to take refuge in Caſtle William, ſituated at the entrance of the harbour.

142
The aſſembly diſſolved.

The governor now took the laſt ſtep in his power to put a ſtop to the violent proceedings of his aſſembly, by diſſolving it entirely; but this was of little moment. Their behaviour had been highly approved by the other colonies, who had written letters to them expreſſive of their approbation. After the diſſolution of the aſſembly, frequent meetings of the people were held in Boſton, which ended in a remonſtrance to the governor, to the ſame purpoſe as ſome of the former; but concluding with a requeſt, that he would take upon him to order the king's ſhips out of the harbour.

143
The diſturbances ſtill increaſe.

While the diſpoſition of the Boſtonians was thus going on from bad to worſe, news arrived that the agent for the colony had not been allowed to deliver their petition to the king; it having been objected, that the aſſembly without the governor was not ſufficient authority.

144
Some troops ordered to Boſton.

This did not contribute to allay the ferment; and it was further augmented by the news that a number of troops had been ordered to repair to Boſton, to keep the inhabitants in awe.

A dreadful alarm now took place. The people called on the governor to convene a general aſſembly, in order to remove their fears of the military; who, they ſaid, were to be aſſembled to overthrow their liberties, and force obedience to laws to which they were entirely averſe. The governor replied, it was no longer in his power to call an aſſembly; having, in his laſt inſtructions from England, been required to wait the king's orders, the matter being then under conſideration at home.

145
The people form an aſſembly called a *Convention*;

Being thus refuſed, the people took upon themſelves the formation of an aſſembly, which they called a *convention*. The proceedings and reſolutions of this body naturally partook of the temper and diſpoſition of the late aſſembly; but they went a ſtep farther, and having voted "that there is apprehenſion in the minds of many of an approaching rupture with France," requeſted the inhabitants to put themſelves in a poſture of defence againſt any ſudden attack of an enemy; and circular letters were directed to all the towns in the province, acquainting them with the reſolutions that had been taken in the capital, and exhorting them to proceed in the ſame manner. The town of Hatfield alone refuſed its concurrence. The convention, however, thought proper to aſſure the governor of their pacific intentions, and renewed their requeſt that an aſſembly might be called; but being refuſed any audience, and threatened with being treated as rebels, they at laſt thought proper to diſſolve of themſelves, and ſent over to Britain a circumſtantial account of their proceedings, with the reaſon of their having aſſembled in the manner already mentioned.

146
Which diſſolves, and vindicates its own conduct.

The expected troops arrived on the very day on which the convention broke up, and had ſome houſes in the town fitted up for their reception. Their arrival had a conſiderable influence on the people, and for ſome time ſeemed to put a ſtop to the diſturbances; but the ſeeds of diſcord had now taken ſuch deep root, that it

was

147
Both houſes of parliament addreſs the king againſt America.

was impoſſible to quench the flame. The late outrageous behaviour in Boſton had given the greateſt offence in England; and, notwithſtanding all the efforts of oppoſition, an addreſs from both houſes of parliament was preſented to the king; in which the behaviour of the colony of Maſſachuſetts-Bay was ſet forth in the moſt ample manner, and the moſt vigorous meaſures recommended for reducing them to obedience. The Americans, however, continued ſtedfaſt in the ideas they had adopted. Though the troops had for ſome time quieted the diſturbances, yet the calm continued no longer than they appeared reſpectable on account of their number; but as ſoon as this was diminiſhed by the departure of a large detachment, the remainder were treated with contempt, and it was even reſolved to expel them altogether. The country people took up arms for this purpoſe, and were to have aſſiſted their friends in Boſton; but before the plot could be put in execution, an event happened which put an end to every idea of reconciliation betwixt the contending parties.

148
Some people killed by the ſoldiers in a mob at Boſton.

149
All the duties excepting that on tea taken off;

150
Which is as violently oppoſed as all the reſt.

On the 5th of March 1770, a ſcuffle happened between the ſoldiers and a party of the town's people. The inhabitants poured in from all quarters to the aſſiſtance of their fellow-citizens; a violent tumult enſued, during which the military fired upon the mob, killing and wounding ſeveral of them. The whole province now roſe in arms, and the ſoldiers were obliged to retire to Caſtle William to prevent their being cut in pieces. Let it be remembered, however, to the praiſe of American virtue, that, on the trial, notwithſtanding popular prejudice and apprehenſion, the captain and ſix of the men were acquitted, two men only being found guilty of manſlaughter. In other reſpects the determinations of the Americans continued, if poſſible, more firm than ever, until at laſt government, determining to act with vigour, and at the ſame time to behave with as much condeſcenſion as poſſible, without abandoning their principles, repealed all the duties lately laid on, that of tea alone excepted. This was left on purpoſe to maintain the dignity of the crown of Britain; and it was thought that it could not be productive of any diſcontent in America, as being an affair of very little moment, the produce of which was not expected to exceed L.16,000. The oppoſition, however, were ſtrenuous in their endeavours to get this tax likewiſe abrogated; inſiſting, that the Americans would conſider it only as inlet to others; and that the repeal of all the reſt, without this, would anſwer no good purpoſe. The event ſhowed that their opinion was well founded. The Americans oppoſed the tea-tax with the ſame violence as they had done all the reſt: and at laſt, on the news that ſalaries had been ſettled on the juſtices of the ſuperior court of Boſton, the governor was addreſſed on the ſubject; the meaſure was condemned in the ſtrongeſt terms; and a committee ſelected out of the ſeveral diſtricts of the colony appointed to inquire into it.

151
Aſſembly of Maſſachuſetts-Bay formally denies the Britiſh right of taxation.

The new aſſembly proceeded in the moſt formal manner to diſavow the ſupremacy of the Britiſh legiſlature; and accuſed the parliament of Britain of having violated the natural rights of the Americans in a number of inſtances. Copies of the tranſactions of this aſſembly were tranſmitted to every town in Maſſachuſetts, exhorting the inhabitants to rouſe themſelves, and exert every nerve in oppoſition to the iron hand of oppreſſion, which was daily tearing the choiceſt fruits from the fair tree of liberty. The diſturbances were alſo greatly heightened by an accidental diſcovery that Mr Hutchinſon, governor of Maſſachuſetts-Bay, had written ſeveral confidential leters to people in power in England, complaining of the behaviour of the province, recommending vigorous meaſures againſt them, and, among other things, aſſerting, that "there muſt be an abridgement of what is called Britiſh liberty." Letters of this kind had fallen into the hands of the agent for the colony at London. They were immediately tranſmitted to Boſton, where the aſſembly was ſitting, by whom they were laid before the governor, who was thus reduced to a very mortifying ſituation. Loſing every idea of reſpect or friendſhip for him as their governor, they inſtantly diſpatched a petition to the king, requeſting him to remove the governor and deputy-governor from their places; but to this they not only received no favourable anſwer, but the petition itſelf was declared groundleſs and ſcandalous.

152
Gov. Hutchiſon's letters to Britiſh miniſtry diſcovered.

153
The petition againſt him refuſed.

Matters were now ripe for the utmoſt extremities on the part of the Americans; and they were brought on in the following manner. Though the colonies had entered into a non-importation agreement againſt tea as well as well as all other commodities from Britain, it had nevertheleſs found its way into America, though in ſmaller quantities than before. This was ſenſibly felt by the Eaſt-India Company, who had now agreed to pay a large ſum annually to government; in recompence for which compliance, and to make up their loſſes in other reſpects, they were empowered to export their tea free from any duty payable in Britain; and in conſequence of this permiſſion, ſeveral ſhips freighted with the commodity were ſent to North-America, and proper agents appointed for diſpoſing of it. The Americans now perceiving that the tax was thus likely to be enforced whether they would or not, determined to take every poſſible method to prevent the tea from being landed, as well knowing that it would be impoſſible to hinder the ſale, ſhould the commodity once be brought on ſhore. For this purpoſe the people aſſembled in great numbers, forcing thoſe to whom the tea was conſigned to reſign their offices, and to promiſe ſolemnly never to reſume them; and committees were appointed to examine the accounts of merchants, and make public teſts, declaring ſuch as would not take them enemies to their country. Nor was this behaviour confined to the colony of Maſſachuſetts-Bay; the reſt of the provinces entered into the conteſt with the ſame warmth, and manifeſted the ſame reſolution to oppoſe this invaſion of their rights.

In the midſt of this confuſion, three ſhips laden with tea arrived in Boſton; but ſo much were the captains alarmed at the diſpoſition which ſeemed to prevail among the people, that they offered, providing they could obtain the proper diſcharges from the tea-conſignees, cuſtom-houſe, and governor, to return to Britain without landing their cargoes. The parties concerned, however, though they durſt not order the tea to be landed, refuſed to grant the diſcharges required. The ſhips, therefore, would have been obliged to remain in the harbour; but the people, apprehenſive that

154 Tea deſtroyed at Boſton.

155 And refuſed admittance in other places.

that if they remained there, the tea would be landed in ſmall quantities and diſpoſed of in ſpite of every endeavour to prevent it, reſolved to deſtroy it at once. This reſolution was executed with equal ſpeed and ſecreſy. The very evening after the above-mentioned diſcharges had been refuſed, a number of people dreſſed like Mohawk Indians boarded the ſhips, and threw into the ſea their whole cargoes, conſiſting of 342 cheſts of tea; after which they retired without making any further diſturbance, or doing any other damage. No tea was deſtroyed in other places, though the ſame ſpirit was every where manifeſted. At Philadelphia the pilots were enjoined not to conduct the veſſels up the river; and at New-York, though the governor cauſed ſome tea to be landed under the protection of a man of war, he was obliged to deliver it up to the cuſtody of the people to prevent its being ſold.

156 Puniſhment of Boſton reſolved on.

157 Arguments and petitions againſt it.

158 And for the impartial adminiſtration of juſtice.

The deſtruction of the tea at Boſton, which happened in November 1773, was the immediate prelude to the diſaſters attending civil diſcord. Government finding themſelves every where inſulted and deſpiſed, reſolved to enforce their authority by all poſſible means; and as Boſton had been the principal ſcene of the riots and outrages, it was determined to puniſh that city in an exemplary manner. Parliament was acquainted by a meſſage from his majeſty with the undutiful behaviour of the city of Boſton, as well as of all the colonies, recommending at the ſame time the moſt vigorous and ſpirited exertions to reduce them to obedience. The parliament in its addreſs promiſed a ready compliance; and, indeed, the Americans ſeemed now to have loſt many of their partiſans. It was propoſed to lay a fine on the town of Boſton equal to the price of the tea which had been deſtroyed, and to ſhut up its port by armed veſſels until the refractory ſpirit of the inhabitants ſhould be ſubdued; which, it was thought, muſt quickly yield, as a total ſtop would thus be put to their trade. The bill was ſtrongly oppoſed on the ſame grounds that the other had been; and it was predicted, that, inſtead of having any tendency to reconcile or ſubdue the Americans, it would infallibly exaſperate them beyond any poſſibility of reconciliation. The petitions againſt it, preſented by the colony's agent, pointed out the ſame conſequence in the ſtrongeſt terms, and in the moſt poſitive manner declared that the Americans never would ſubmit to it; but ſuch was the infatuation attending every rank and degree of men, that it never was imagined the Americans would dare to reſiſt the parent ſtate openly, but would in the end ſubmit implicitly to her commands. In this confidence, a third bill was propoſed for the impartial adminiſtration of juſtice on ſuch perſons as might be employed in the ſuppreſſion of riots and tumults in the province of Maſſachuſetts-Bay. By this act it was provided, that ſhould any perſons acting in that capacity be indicted for murder, and not able to obtain a fair trial in the province, they might be ſent by the governor to England, or to ſome other colony, if neceſſary, to be tried for the ſuppoſed crime.

159 Quebec bill

Theſe three bills having paſſed ſo eaſily, the miniſtry propoſed a fourth, relative to the government of Canada; which, it was ſaid, had not yet been ſettled on any proper plan. By this bill the extent of that province was greatly enlarged; its affairs were put under the direction of a council in which Roman Catholics were to be admitted; the Roman Catholic clergy were ſecured in their poſſeſſions and the uſual perquiſites from thoſe of their own profeſſion. The council above mentioned were to be appointed by the crown; to be removeable at its pleaſure; and to be inveſted with every legiſlative power, excepting that of taxation.

160 Theſe acts exaſperate the Americans.

No ſooner were theſe laws made known in America, than they cemented the union of the colonies almoſt beyond any poſſibility of diſſolving it. The aſſembly of Maſſachuſetts-Bay had paſſed a vote againſt the judges accepting ſalaries from the crown, and put the queſtion, Whether they would accept them as uſual from the general aſſembly? Four anſwered in the affirmative; but Peter Oliver, the chief-juſtice, refuſed. A petition againſt him, and an accuſation, were brought before the governor; but the latter refuſed the accuſation, and declined to interfere in the matter; but as they ſtill inſiſted for juſtice againſt Mr Oliver, the governor thought proper to put an end to the matter by diſſolving the aſſembly.

161 Reſentment occaſioned by the port-bill.

162 Proceedings of the general aſſembly met at Salem.

In this ſituation of affairs, a new alarm was occaſioned by the news of the port-bill. This had been totally unexpected, and was received with the moſt extravagant expreſſions of diſpleaſure among the populace; and while theſe continued, the new governor, General Gage, arrived from England. He had been choſen to this office on account of his being well acquainted in America, and generally agreeable to the people; but human wiſdom could not now point out a method by which the flame could be allayed. The firſt act of his office as governor was to remove the aſſembly to Salem, a town 17 miles diſtant, in conſequence of the late act. When this was intimated to the aſſembly, they replied by requeſting him to appoint a day of public humiliation for deprecating the wrath of heaven, but met with a refuſal. When met at Salem, they paſſed a reſolution, declaring the neceſſity of a general congreſs compoſed of delegates from all the provinces, in order to take the affairs of the colonies at large into conſideration; and five gentlemen, remarkable for their oppoſition to the Britiſh meaſures, were choſen to repreſent that of Maſſachuſetts-Bay. They then proceeded with all expedition to draw up a declaration, containing a detail of the grievances they laboured under, and the neceſſity of exerting themſelves againſt lawleſs power; they ſet forth the diſregard ſhown to their petitions, and the attempts of Great Britain to deſtroy their ancient conſtitution; and concluded with exhorting the inhabitants of the colony to obſtruct, by every method in their power, ſuch evil deſigns, recommending at the ſame time a total renunciation of every thing imported from Great Britain, till a redreſs of grievances could be procured.

163 Generoſity of the people of Salem to thoſe of Boſton.

Intelligence of this declaration was carried to the governor on the very day that it was completed; on which he diſſolved the aſſembly. This was followed by an addreſs from the inhabitants of Salem in favour of thoſe of Boſton, and concluding with theſe remarkable words: "By ſhutting up the port of Boſton, ſome imagine that the courſe of trade might be turned hither, and to our benefit; but nature, in the formation of our harbour, forbids our becoming rivals in commerce with that convenient mart; and were it otherwiſe, we muſt be dead to every idea of juſtice, loſt to all feelings of humanity, could we indulge one thought to ſeize on wealth, and raiſe our fortunes on the ruin of our ſuffering neighbours."

164
The cauſe of Boſton eſpouſed by all the reſt of the colonies.

It had been fondly hoped by the miniſterial party at home, that the advantages which other towns of the colony might derive from the annihilation of the trade of Boſton, would make them readily acquieſce in the meaſure of ſhutting up that port, and rather rejoice in it than otherwiſe; but the words of the addreſs above-mentioned ſeemed to preclude all hope of this kind; and ſubſequent tranſactions ſoon manifeſted it to be totally vain. No ſooner did intelligence arrive of the remaining bills paſſed in the ſeſſion of 1774, than the cauſe of Boſton became the cauſe of all the colonies. The port-bill had already occaſioned violent commotions throughout them all. It had been reprobated in provincial meetings, and reſiſtance even to the laſt had been recommended againſt ſuch oppreſſion. In Virginia, the firſt of June, the day on which the port of Boſton was to be ſhut up, was held as a day of humiliation, and a public interceſſion in favour of America was enjoined. The ſtyle of the prayer enjoined at this time was, that "God would give the people one heart and one mind, firmly to oppoſe every invaſion of the American rights." The Virginians, however, did not content themſelves with acts of religion. They recommended in the ſtrongeſt manner a general congreſs of all the colonies, as fully perſuaded that an attempt to tax any colony in an arbitrary manner was in reality an attack upon them all, and muſt ultimately end in the ruin of them all.

165
The Americans firmly united in their oppoſition to Britain.

The provinces of New York and Penſylvania, however, were leſs ſanguine than the reſt, being ſo cloſely connected in the way of trade with Great Britain, that the giving it up entirely appeared a matter of the moſt ſerious magnitude, and not to be thought of but after every other method had failed. The intelligence of the remaining bills reſpecting Boſton, however, ſpread a freſh alarm throughout the continent, and fixed thoſe who had ſeemed to be the moſt wavering. The propoſal of giving up all commercial intercourſe with Britain was again propoſed; contributions for the inhabitants of Boſton were raiſed in every quarter; and they every day received addreſſes commending them for the heroic courage with which they ſuſtained their calamity.

166
Solemn league and covenant formed at Boſton.

167
The governor attempts in vain to counteract it by proclamation.

The Boſtonians on their part were not wanting in their endeavours to promote the general cauſe. An agreement was framed, which, in imitation of former times, they called a Solemn League and Covenant. By this the ſubſcribers moſt religiouſly bound themſelves to break off all communication with Britain after the expiration of the month of Auguſt enſuing, until the obnoxious acts were repealed; at the ſame time they engaged neither to purchaſe nor uſe any goods imported after that time, and to renounce all connection with thoſe who did, or who refuſed to ſubſcribe to this covenant; threatening to publiſh the names of the refractory; which at this time was a puniſhment by no means to be deſpiſed. Agreements of a ſimilar kind were almoſt inſtantaneouſly entered into throughout all America. General Gage indeed attempted to counteract the covenant by a proclamation, wherein it was declared an illegal and traiterous combination, threatening with the pains of law ſuch as ſubſcribed or countenanced it. But matters were too far gone for his proclamations to have any effect. The Americans retorted the charge of illegality on his own proclamation, and inſiſted that the law allowed ſubjects to meet in order to conſider of their grievances, and aſſociate for relief from oppreſſion.

168
Congreſs meets at Philadelphia.

Preparations were now made for holding the general congreſs ſo often propoſed. Philadelphia, as being the moſt centrical and conſiderable town, was pitched upon for the place of its meeting. The delegates, of whom it was to be compoſed, were choſen by the repreſentatives of each province, and were in number from two to ſeven for each colony, though no province had more than one vote. The firſt congreſs, which met at Philadelphia, in the beginning of September 1774, conſiſted of 51 delegates. The novelty and importance of the meeting excited an univerſal attention; and their tranſactions were ſuch as could not but tend to render them reſpectable.

169
Account of its tranſactions.

The firſt act of congreſs was an approbation of the conduct of Maſſachuſetts-Bay, and an exhortation to continue in the ſame ſpirit with which they had begun. Supplies for the ſuffering inhabitants (whom the operation of the port-bill had reduced to great diſtreſs) were ſtrongly recommended; and it was declared, that in caſe of attempts to enforce the obnoxious acts by arms, all America ſhould join to aſſiſt the town of Boſton; and, ſhould the inhabitants be obliged, during the courſe of hoſtilities, to remove further up the country, the loſſes they might ſuſtain ſhould be repaired at the public expence.

They next addreſſed General Gage by letter; in which, having ſtated the grievances of the people of Maſſachuſetts colony, they informed him of the fixed and unalterable determination of all the other provinces to ſupport their brethren and to oppoſe the Britiſh acts of parliament; that they themſelves were appointed to watch over the liberties of America; and intreated him to deſiſt from military operations, leſt ſuch hoſtilities might be brought on as would fruſtrate all hopes of reconciliation with the parent ſtate.

The next ſtep was to publiſh a declaration of their rights. Theſe they ſummed up in the rights belonging to Engliſhmen; and particularly inſiſted, that as their diſtance rendered it impoſſible for them to be repreſented in the Britiſh parliament, their provincial aſſemblies, with the governor appointed by the king, conſtituted the only legiſlative power within each province. They would, however, conſent to ſuch acts of parliament as were evidently calculated merely for the regulation of commerce, and ſecuring to the parent ſtate the benefits of the American trade; but would never allow that they could impoſe any tax on the colonies, for the purpoſe of raiſing a revenue, without their conſent. They proceeded to reprobate the intention of each of the new acts of parliament; and inſiſted on all the rights they had enumerated as being unalienable, and what none could deprive them of. The Canada act they particularly pointed out as being extremely inimical to the colonies, by whoſe aſſiſtance it had been conquered; and they termed it "An act for eſtabliſhing the Roman Catholic religion in Canada, aboliſhing the equitable ſyſtem of Engliſh laws, and eſtabliſhing a tyranny there." They further declared in favour of a non-importation and non-conſumption of Britiſh goods, until the acts were repealed by which duties were impoſed upon tea, coffee, wine, ſugar, and molaſſes, imported into America, as well as the Boſton port-act, and the three others paſſed in the preceding ſeſſion of parliament. The new regulations againſt the importation and conſumption of Britiſh commodities were then drawn up with great ſolemnity; and they concluded with returning the warmeſt thanks to thoſe members of parliament who had, with ſo much zeal, though without any ſucceſs, oppoſed the obnoxious acts of parliament.

Their next proceedings were, to frame a petition to the king, an addreſs to the Britiſh nation, and another to the colonies; all of which were ſo much in the uſual ſtrain of American language for ſome time paſt, that it is needleſs to enter into any particular account of them. It is ſufficient to ſay, that they were all drawn up in a maſterly manner, and ought to have impreſſed the people of England with a more favourable idea of the Americans that they could at that time be induced to entertain.

All this time the diſpoſition of the people had correſponded with the warmeſt wiſhes of congreſs. The firſt of June had been kept as a faſt, not only throughout Virginia, where it was firſt propoſed, but through the whole continent. Contributions for the diſtreſſes of Boſton had been raiſed throughout America, and people of all ranks ſeemed to be particularly touched with them. Even thoſe who ſeemed to be moſt likely to derive advantages from them, took no opportunity, as has been already inſtanced in the caſe of Salem.

170
Generoſity of the inhabitants of Marblehead to Boſton.

The inhabitants of Marblehead alſo ſhowed a noble example of magnanimity in the preſent caſe. Though ſituated in the neighbourhood of Boſton, and moſt likely to derive benefit from their diſtreſſes, they did not attempt to take any advantage, but generouſly offered the uſe of their harbour to the Boſtonians, as well as their wharfs and warehouſes, free of all expence. In the mean time the Britiſh forces at Boſton were continually increaſing in number, which greatly augmented the general jealouſy and diſaffection; the country were ready to riſe at a moment's warning;

171
Extreme attachment of the country people to the Boſtonians.

and the experiment was made by giving a falſe alarm that the communication between the town and country was to be cut off, in order to reduce the former by famine to a compliance with the acts of parliament. On this intelligence, the country people aſſembled in great numbers, and could not be ſatisfied till they had ſent meſſengers into the city to enquire into the truth of the report. Theſe meſſengers were enjoined to inform the town's people, that if they ſhould be ſo puſillanimous as to make a ſurrender of their liberties, the province would not think itſelf bound by ſuch examples; and that Britain, by breaking their original charter, had annulled the contract ſubſiſting between them, and left them to act as they thought proper.

The people in every other reſpect manifeſted their inflexible determination to adhere to the plan they had ſo long followed. The new counſellors and judges were obliged to reſign their offices, in order to preſerve their lives and properties from the fury of the multitude. In ſome places they ſhut up the avenues to the court-houſes; and, when required to make way for the judges, replied, that they knew of none but ſuch as were appointed by the ancient uſage and cuſtom of the province. Every where they manifeſted the moſt ardent deſire of learning the art of war; and every individual who could bear arms, was moſt aſſiduous in procuring them, and learning their exerciſe.

172
Gen. Gage fortifies Boſton Neck,

Matters at laſt proceeded to ſuch an height, that General Gage thought proper to fortify the neck of land which joins the town of Boſton to the continent. This, though undoubtedly a prudent meaſure in his ſituation, was exclaimed againſt by the Americans in the moſt vehement manner; but the General, inſtead of giving ear to their remonſtrances, deprived them of all power of acting againſt himſelf, by ſeizing the provincial powder, ammunition, and military ſtores at Cambridge and Charleſtown.

173
And ſeizes the military ſtores belonging to the province.

This excited ſuch indignation, that it was with the utmoſt difficulty the people could be reſtrained from marching to Boſton and attacking the troops. Even in the town itſelf, the company of cadets that uſed to attend him diſbanded themſelves, and returned the ſtandard he had as uſual preſented them with on his acceſſion to the government. This was occaſioned by his having deprived the celebrated patriot John Hancock, afterwards preſident of the congreſs, of his commiſſion as colonel of the cadets. A ſimilar inſtance happened of a provincial colonel having accepted a ſeat in the new council; upon which 24 officers of his regiment reſigned their commiſſions in one day.

174
Oppoſition to the Britiſh parliament ſtill increaſes.

In the mean time a meeting was held of the principal inhabitants of the towns adjacent to Boſton. The purport of this was publicly to renounce all obedience to the late acts of parliament, and to form an engagement to indemnify ſuch as ſhould be proſecuted on that account; the members of the new council were declared violators of the rights of their country; all ranks and degrees were exhorted to learn the uſe of arms; and the receivers of the public revenue were ordered not to deliver it into the treaſury, but to retain it in their own hands till the conſtitution ſhould be reſtored, or a provincial congreſs diſpoſe of it otherwiſe.

A remonſtrance againſt the fortifications on Boſton Neck was next prepared; in which, however, they ſtill declared their unwillingneſs to proceed to any hoſtile meaſures; aſſerting only as uſual their firm determination not to ſubmit to the acts of parliament they had already ſo much complained of.

175
A general aſſembly called and diſſolved by proclamation.

The governor, to reſtore tranquillity, if poſſible, called a general aſſembly; but ſo many of the council had reſigned their ſeats, that he was induced to countermand its ſitting by proclamation. This meaſure, however, was deemed illegal; the aſſembly met at Salem; and, after waiting a day for the governor, voted themſelves into a provincial congreſs, of which Mr Hancock was choſen preſident. A committee was inſtantly appointed, who waited on the governor with a remonſtrance concerning the fortifications on Boſton Neck; but nothing of conſequence took place, both parties mutually criminating each other. The winter was now coming on, and the governor, to avoid quartering the ſoldiers upon the inhabitants, propoſed to erect barracks for them;

176
Gen. Gage meets with great difficulties in accommodating his troops.

but the ſelect-men of Boſton compelled the workmen to deſiſt. Carpenters were ſent for to New-York, but they were refuſed; and it was with the utmoſt difficulty that he could procure winter-lodgings for his troops. Nor was the difficulty leſs in procuring clothes; as the merchants of New-York told him, that "they would never ſupply any article for the benefit of men ſent as enemies to their country."

177
The Americans make preparations for war.

This diſpoſition, known to be almoſt univerſal throughout the continent, was in the higheſt degree ſatisfactory to congreſs. Every one ſaw that the enſuing ſpring was to be the ſeaſon of commencing hoſtilities, and the moſt indefatigable diligence was uſed by the colonies to be well-provided againſt ſuch a formidable enemy. A liſt of all the fencible men in each colony was made out, and eſpecially of thoſe who had ſerved in the former war; of whom they had the ſatisfaction to find that two-thirds were ſtill alive and fit to bear arms. Magazines of arms were collected, and money was provided for the payment of troops. The governors invain attempted to put a ſtop to theſe proceedings by proclamations; the fatal period was now arrived: and the more the ſervants of government attempted to repreſs the ſpirit of the Americans, the more violent it appeared.

178
Diſtreſs of the inhabitants of Boſton.

In the mean time the inhabitants of Boſton were reduced to great diſtreſs. The Britiſh troops, now diſtinguiſhed by the name of the *enemy*, were abſolutely in poſſeſſion of it; the inhabitants were kept as priſoners, and might be made accountable for the conduct of the whole colonies; and various meaſures were contrived to relieve the latter from ſuch a diſagreeable ſituation. Sometimes it was thought expedient to remove the inhabitants altogether; but this was impracticable without the governor's conſent. It was then propoſed to ſet fire to the town at once, after valuing the houſes and indemnifying the proprietors; but this being found equally impracticable, it was reſolved to wait ſome other opportunity, as the garriſon were not very numerous, and, not being ſupplied with neceſſaries by the inhabitants, might ſoon be obliged to leave the place. The friends of Britiſh government indeed attempted to do ſomething in oppoſition to the general voice of the people; but, after a few ineffectual meetings and reſolutions, they were utterly ſilenced, and obliged to yield to the ſuperior number of their adverſaries.

179
Military ſtores ſeized by the Americans.

Matters had now proceeded ſo far that every idea of reconciliation or friendſhip with Britain was loſt. The Americans therefore, without ceremony, began to ſeize on the military ſtores and ammunition belonging to government. This firſt commenced at New-port in Rhode-Iſland, where the inhabitants carried off 40 pieces of cannon appointed for the protection of the place; and on being aſked the reaſon of this proceeding, they replied, that the people had ſeized them leſt they ſhould be made uſe of againſt themſelves. After this the aſſembly met, and reſolved that ammunition and warlike ſtores ſhould be purchaſed with the public money.

New-Hampſhire followed the example of Rhode-Iſland, and ſeized a ſmall fort for the ſake of the powder and military ſtores it contained. In Penſylvania, however, a convention was held, which expreſſed an earneſt deſire of reconciliation with the mother-country; though, at the ſame time, in the ſtrongeſt manner declaring, that they were reſolved to take up arms in defence of their juſt rights, and defend to the laſt their oppoſition to the late acts of parliament; and the people were exhorted to apply themſelves with the greateſt aſſiduity to the proſecution of ſuch manufactures as were neceſſary for their defence and ſubſiſtence, ſuch as ſalt, ſalt-petre, gunpowder, ſteel, &c. This was the univerſal voice of the colonies, New-York only excepted. The aſſembly of that province, as yet ignorant of the fate of their laſt remonſtrance, refuſed to concur with the other colonies in their determination to throw off the Britiſh yoke: their attachment, however, was very faint, and by the event it appeared that a perſeverance in the meaſures which the miniſtry had adopted was ſufficient to unite them to the reſt.

180
Maſſachuſetts aſſembly recommend preparations for war.

As the diſturbances had originated in the province of Maſſachuſetts-Bay, and *there* continued all along with the greateſt violence, ſo this was the province where the firſt hoſtilities were formally commenced. In the beginning of February the provincial congreſs met at Cambridge; and as no friends to Britain could now find admittance to that aſſembly, the only conſideration was how to make proper preparations for war. Expertneſs in military diſcipline was recommended in the ſtrongeſt manner, and ſeveral military inſtitutions enacted; among which that of the *minute-men* was one of the moſt remarkable. Theſe were choſen from the moſt active and expert among the militia; and their buſineſs was to keep themſelves in conſtant readineſs at the call of their officers; from which perpetual vigilance they derived their title.—It was now eaſily ſeen that a ſlight occaſion would bring on hoſtilities, which could not but be attended with the moſt violent and certain deſtruction to the vanquiſhed party; for both were ſo much exaſperated by a long courſe of reproaches and literary warfare, that they ſeemed to be filled with the utmoſt inveteracy againſt each other.

On the 26th of February General Gage having been informed that a number of field-pieces had been brought to Salem, diſpatched a party to ſeize them. Their road was obſtructed by a river, over which was a draw-bridge. This the people had pulled up, and refuſed to let down: upon which the ſoldiers ſeized a boat to ferry them over; but the people cut out her bottom. Hoſtilities would immediately have commenced, had it not been for the interpoſition of a clergyman, who repreſented to the military, on the one hand, the folly of oppoſing ſuch numbers; and to the people, on the other, that as the day was far ſpent the military could not execute their deſign, ſo that they might without any fear leave them the quiet poſſeſſion of the draw-bridge. This was complied with; and the ſoldiers, after having remained for ſome time at the bridge, returned without executing their orders.

181
Skirmiſh at Lexington.

The next attempt, however, was attended with more ſerious conſequences. General Gage, having been informed that a large quantity of ammunition and military ſtores had been collected at Concord, about 20 miles from Boſton, and where the provincial congreſs was ſitting, ſent a detachment, under the command of Colonel Smith and Major Pitcairn, to deſtroy the ſtores, and, as was reported, to ſeize Meſſrs. Hancock and Adams, the leading men of the congreſs. They ſet out before day-break, on the 19th of April, marching with the utmoſt ſilence, and ſecuring every one they met on the road, that they might not be diſcovered. But notwithſtanding all their care, the continual ringing of bells and firing of guns as they went along, ſoon gave them notice that the country was alarmed.

About five in the morning they had reached Lexington, 15 miles from Boſton, where the militia of the place were exerciſing. An officer called out to them to diſperſe; but, as they ſtill continued in a body, he advanced, diſcharged his piſtol, and ordered his ſoldiers to fire; who inſtantly obeyed, and killed and wounded ſeveral of the militia. The detachment then proceeded to Concord, where, having deſtroyed the ſtores, they were encountered by the Americans; and a ſcuffle enſued, in which ſeveral fell on both ſides. The purpoſe of their expedition being thus accompliſhed, it was neceſſary for the king's troops to retreat, which they did through a continual fire kept upon them from Concord to Lexington. Here their ammunition was totally expended; and they would have been unavoidably cut off, had not a conſiderable reinforcement commanded by Lord Percy met them. The Americans, however, continued their attack with great fury; and the Britiſh would ſtill have been in the utmoſt danger had it not been for two field-pieces which Lord Percy had brought with him. By theſe the impetuoſity of the Americans was checked, and the Britiſh made good their retreat to Boſton with the loſs of 250 killed and wounded: that of the Americans was about 60.

182
A great army aſſembles before Boſton.

By this engagement the ſpirits of the Americans were ſo raiſed, that they meditated nothing leſs than the total expulſion of the Britiſh troops from Boſton. An army of 20,000 men was aſſembled, who formed a line of encampment from Roxbury to Myſtic, through a ſpace of about 30 miles; and here they were ſoon after joined by a large body of Connecticut troops, under General Putnam, an old officer of great bravery and experience. By this formidable force was the town of Boſton now kept blocked up. General Gage, however, had ſo ſtrongly fortified it, that the enemy, powerful as they were, durſt not make an attack; while, on the other hand, his force was by far too inſignificant to meet ſuch an enemy in the field. But towards the end of May, a conſiderable reinforcement having arrived, with Generals Howe, Burgoyne, and Clinton, he was ſoon enabled to attempt ſomething of conſequence; and this, the boaſts of the provincials, that they were beſieging thoſe who had been ſent to ſubdue them, ſeemed to render neceſſary. Some ſkirmiſhes in the mean time happened in the iſlands lying off Boſton harbour, in which the Americans had the advantage, and burnt an armed ſchooner, which her people had been obliged to abandon after ſhe was left aground by the tide. Nothing deciſive, however, took place till the 17th of June.

183
Battle at Bunker's Hill.

In the neighbourhood of Charleſtown, a place on the northern ſhore of the peninſula on which Boſton ſtands, is an high ground called *Bunker's Hill*, which overlooks and commands the whole town of Boſton. In the night of the 16th the provincials took poſſeſſion of this place; and worked with ſuch indefatigable diligence, that, to the aſtoniſhment of their enemies, they had, before day-light, almoſt completed a redoubt, with a ſtrong entrenchment reaching half a mile eaſtward, as far as the river Myſtic. After this they were obliged to ſuſtain a heavy and inceſſant fire from the ſhips and floating batteries with which Charleſtown neck was ſurrounded, as well as the cannon that could reach the place from Boſton; in ſpite of which, however, they continued their work, and finiſhed it before mid-day. A conſiderable body of foot was then landed at the foot of Bunker's Hill, under the command of Generals Howe and Pigot; the former being appointed to attack the lines, and the latter the redoubt. The Americans, however, having the advantage of the ground, as well as of their intrenchments, poured down ſuch inceſſant volleys as threatened the whole body with deſtruction; and General Howe was for a little time left almoſt alone, all his officers being killed or wounded. The provincials in the mean time had taken poſſeſſion of Charleſtown, ſo that General Pigot was obliged to contend with them in that place as well as in the redoubt. The conſequence was, that he was overmatched; his troops were thrown into diſorder; and he would in all probability have been defeated, had not General Clinton advanced to his relief: upon which the attack was renewed with ſuch fury, that the provincials were driven beyond the neck that leads to Charleſtown. In the heat of the engagement the Britiſh troops, in order to deprive the enemy of a cover, ſet fire to Charleſtown, which was totally conſumed; and, eventually, the Americans were obliged to retreat over Charleſtown neck, which was raked by an inceſſant fire from the Glaſgow man of war, and ſeveral floating batteries. The loſs on the Britiſh ſide amounted to about 1000, among whom were 19 officers killed and 70 wounded; that of the Americans did not exceed 500.

The Britiſh troops claimed the victory in this engagement; but it muſt be allowed that it was dearly bought; and the Americans boaſted that the real advantages were on their ſide, as they had ſo much weakened the enemy that they durſt not afterwards venture out of their entrenchments. Conſidering that this was the firſt time the provincials had been in actual ſervice, it muſt be owned that they behaved with great ſpirit, and by no means merited the appellation of *cowards*, with which they were ſo often branded in Britain.

184
The Americans become more and more determined in their oppoſition.

In other places the ſame determined ſpirit of reſiſtance appeared on the part of the Americans. Lord North's conciliatory ſcheme was utterly rejected by the aſſemblies of Penſylvania and New-Jerſey, and afterwards in every other colony. The commencement of hoſtilities at Lexington determined the colony of New-York, which had hitherto continued to waver, to unite with the reſt; and as the ſituation of New-York renders it unable to reſiſt an attack from the ſea, it was reſolved, before the arrival of a Britiſh fleet, to ſecure the military ſtores, ſend off the women and children, and to ſet fire to the city if it was ſtill found incapable of defence. The exportation of proviſions was every where prohibited, particularly to the Britiſh fiſhery on the banks of Newfoundland, or to ſuch colonies of America as ſhould adhere to the Britiſh intereſt. Congreſs reſolved on the eſtabliſhment of an army, and of a large paper-currency in order to ſupport it. In the inland northern colonies, Colonels Eaſton and Ethan Allen, without receiving any orders from Congreſs, or communicating their deſign to any body, with a party of only 250 men, ſurpriſed the forts of Crown-Point, Ticonderago, and the reſt that form a communication betwixt the colonies and Canada. On this occaſion 200 pieces of cannon fell into their hands, beſides mortars and a large quantity of military ſtores, together with two armed veſſels, and materials for the conſtruction of others.

185
Crown-Point and Ticonderago taken by the Americans.

After the battle of Bunker's Hill, the provincials erected fortifications on the heights which commanded Charleſtown, and ſtrengthened the reſt in ſuch a manner that there was no hope of driving them from thence; at the ſame time that their activity and boldneſs aſtoniſhed the Britiſh officers, who had been accuſtomed to entertain a mean and unjuſt opinion of their courage.

186 Troops in Boſton diſtreſſed.

The troops, thus ſhut up in Boſton, were ſoon reduced to diſtreſs. Their neceſſities obliged them to attempt the carrying off the American cattle on the iſlands before Boſton, which produced frequent ſkirmiſhes; but the provincials, better acquainted with the navigation of theſe ſhores, landed on the iſlands, deſtroyed or carried off whatever was of any uſe, burned the light-houſe at the entrance of the harbour, and took priſoners the workmen ſent to repair it, as well as a party of marines who guarded them. Thus the garriſon were reduced to the neceſſity of ſending out armed veſſels to make prizes indiſcriminately of all that came in their way, and of landing in different places to plunder for ſubſiſtence as well as they could.

187 Articles of union between the colonies.

The congreſs in the mean time continued to act with all the vigour which its conſtituents had expected. Articles of confederation and perpetual union were drawn up and ſolemnly agreed upon; by which they bound themſelves and their poſterity for ever. Theſe were in ſubſtance as follows.

1. Each colony was to be independent within itſelf, and to retain an abſolute ſovereignty in all domeſtic affairs.

2. Delegates to be annually elected to meet in congreſs, at ſuch time and place as ſhould be enacted in the preceding congreſs.

3. This aſſembly ſhould have the power of determining war or peace, making alliances; and in ſhort all that power which ſovereigns of ſtates uſually claim as their own.

4. The expences of war to be paid out of the common treaſury, and raiſed by a poll-tax on males between 16 and 60; the proportions to be determined by the laws of the colony.

5. An executive council to be appointed to act in place of the congreſs during its receſs.

6. No colony to make war with the Indians without conſent of congreſs.

7. The boundaries of all the Indian lands to be ſecured and aſcertained to them; and no purchaſes of lands were to be made by individuals, or even by a colony, without conſent of congreſs.

8. Agents appointed by congreſs ſhould reſide among the Indians, to prevent frauds in trading with them, and to relieve, at the public expence, their wants and diſtreſſes.

9. This confederation to laſt until there ſhould be a reconciliation with Britain; or, if that event ſhould not take place, it was to be perpetual.

188 Declaration on taking up arms.

After the action of Bunker's Hill, however, when the power of Great Britain appeared leſs formidable in the eyes of America than before, congreſs proceeded formally to juſtify their proceedings in a declaration drawn up in terms more expreſſive, and well calculated to excite attention.

"Were it poſſible (ſaid they) for men who exerciſe their reaſon, to believe that the divine Author of our exiſtence intended a part of the human race to hold an abſolute property in and unbounded power over others, marked out by His infinite goodneſs and wiſdom as the objects of a legal domination, never rightfully reſiſtible, however ſevere and oppreſſive; the inhabitants of theſe colonies might at leaſt require from the parliament of Great-Britain ſome evidence that this dreadful authority over them had been granted to that body: but a reverence for our Great Creator, principles of humanity, and the dictates of common ſenſe, muſt convince all thoſe who reflect upon the ſubject, that government was inſtituted to promote the welfare of mankind, and ought to be adminiſtered for the attainment of that end.

"The legiſlature of Great-Britain, however, ſtimulated by an inordinate paſſion for power, not only unjuſtifiable, but which they know to be peculiarly reprobated by the very conſtitution of that kingdom; and deſpairing of ſucceſs in any mode of conteſt where regard ſhould be had to law, truth, or right; have, at length, deſerting thoſe, attempted to effect their cruel and impolitic purpoſe of enſlaving theſe colonies by violence, and have thereby rendered it neceſſary for us to cloſe with their laſt appeal from reaſon to arms. Yet, however blinded that aſſembly may be, by their intemperate rage for unlimited domination, ſo to ſlight juſtice in the opinion of mankind, we eſteem ourſelves bound by obligations to the reſt of the world to make known the juſtice of our cauſe."

After taking notice of the manner in which their anceſtors left Britain, the happineſs attending the mutual friendly commerce betwixt that country and her colonies, and the remarkable ſucceſs of the late war, they proceed as follows: "The new miniſtry, finding the brave foes of Britain, though frequently defeated, yet ſtill contending, took up the unfortunate idea of granting them a haſty peace, and of then ſubduing her faithful friends.

"Theſe devoted colonies were judged to be in ſuch a ſtate as to preſent victories without bloodſhed, and all the eaſy emoluments of ſtatutable plunder. The uninterrupted tenor of their peaceable and reſpectful behaviour from the beginning of their colonization; their dutiful, zealous, and uſeful ſervices during the war, though ſo recently and amply acknowledged in the moſt honourable manner by his Majeſty, by the late king, and by parliament, could not ſave them from the intended innovations. Parliament was influenced to adopt the pernicious project; and aſſuming a new power over them, has in the courſe of eleven years given ſuch deciſive ſpecimens of the ſpirit and conſequences attending this power, as to leave no doubt of the effects of acquieſcence under it.

"They have undertaken to give and grant our money without our conſent, though we have ever exerciſed an excluſive right to diſpoſe of our own property. Statutes have been paſſed for extending the juriſdiction of the courts of admiralty and vice-admiralty beyond their ancient limits; for depriving us of the accuſtomed and ineſtimable rights of trial by jury, in caſes affecting both life and property; for ſuſpending the legiſlature of one of our colonies; for interdicting all commerce to the capital of another; and for altering fundamentally the form of government eſtabliſhed by charter, and ſecured by acts of its own legiſlature;

and ſolemnly confirmed by the crown; for exempting the murderers of coloniſts from legal trial, and in effect from puniſhment; for erecting in a neighbouring province, acquired by the joint arms of Great-Britain and America, a deſpotiſm dangerous to our very exiſtence; and for quartering ſoldiers upon the coloniſts in time of a profound peace. It has alſo been reſolved in parliament, that coloniſts, charged with committing certain offences, ſhall be tranſported to England to be tried.

“ But why ſhould we enumerate our injuries in detail?—By one ſtatute it was declared, that parliament can of right make laws to bind us in all caſes whatever. What is to defend us againſt ſo enormous, ſo unlimited a power? Not a ſingle perſon who aſſumes it is choſen by us, or is ſubject to our controul or influence; but, on the contrary, they are all of them exempt from the operation of ſuch laws; and an American revenue, if not diverted from the oſtenſible purpoſes for which it is raiſed, would actually lighten their own burdens in proportion as it increaſes ours.

“ We ſaw the miſery to which ſuch deſpotiſm would reduce us. We for ten years inceſſantly and ineffectually beſieged the throne as ſupplicants; we reaſoned, we remonſtrated with parliament in the moſt mild and decent language; but adminiſtration, ſenſible that we ſhould regard theſe meaſures as freemen ought to do, ſent over fleets and armies to enforce them.

“ We have purſued every temperate, every reſpectful meaſure; we have even proceeded to break off all commercial intercourſe with our fellow-ſubjects, as our laſt peaceable admonition, that our attachment to no nation on earth would ſupplant our attachment to liberty; this we flattered ourſelves was the ultimate ſtep of the controverſy; but ſubſequent events have ſhown how vain was this hope of finding moderation in our enemies!

“ The Lords and Commons, in their addreſs in the month of February, ſaid, that a rebellion at that time actually exiſted in the province of Maſſachuſetts-Bay; and that thoſe concerned in it had been countenanced and encouraged by unlawful combinations and engagements entered into by his majeſty's ſubjects in ſeveral of the colonies; and therefore they beſought his Majeſty that he would take the moſt effectual meaſures to enforce due obedience to the laws and authority of the ſupreme legiſlature. Soon after the commercial intercourſe of whole colonies with foreign countries was cut off by an act of parliament; by another, ſeveral of them were entirely prohibited from the fiſheries in the ſeas near their coaſts, on which they always depended for their ſubſiſtence; and large reinforcements of ſhips and troops were immediately ſent over to General Gage.

“ Fruitleſs were all the intreaties, arguments, and eloquence of an illuſtrious band of the moſt diſtinguiſhed peers and commoners, who nobly and ſtrenuouſly aſſerted the juſtice of our cauſe, to ſtay, or even to mitigate, the heedleſs fury with which theſe accumulated outrages were hurried on. Equally fruitleſs was the interference of the city of London, of Briſtol, and of many other reſpectable towns in our favour.”

After having reproached parliament, General Gage, and the Britiſh government in general, they proceed thus: “ We are reduced to the alternative of chooſing an unconditional ſubmiſſion to tyranny, or reſiſtance by force. The latter is our choice. We have counted the coſt of this conteſt, and find nothing ſo dreadful as voluntary ſlavery. Honour, juſtice, and humanity, forbid us tamely to ſurrender that freedom which we received from our gallant anceſtors, and which our innocent poſterity have a right to receive from us. Our cauſe is juſt; our union is perfect; our internal reſources are great; and, if neceſſary, foreign aſſiſtance is undoubtedly attainable. We fight not for glory or conqueſt; we exhibit to mankind the remarkable ſpectacle of a people attacked by unprovoked enemies. They boaſt of their privileges and civilization, and yet proffer no milder conditions than ſervitude or death. In our native land, in defence of the freedom that is our birthright, for the protection of our property acquired by the honeſt induſtry of our forefathers and our own, againſt violence actually offered, we have taken up arms; we ſhall lay them down when hoſtilities ſhall ceaſe on the part of our aggreſſors, and all danger of their being renewed ſhall be removed—and not before.”

189
Quebec bill diſagreeable to thoſe whom it was intended to pleaſe.

Theſe are ſome of the moſt ſtriking paſſages in the declaration of congreſs on taking up arms againſt Great-Britain, and dated July 6th, 1775. Without inquiring whether the principles on which it is founded are right or wrong, the determined ſpirit which it ſhows, ought to have convinced the people of Britain, that the conqueſt of America was an event ſcarce ever to be expected. In every other reſpect an equal ſpirit was ſhown; and the rulers of the Britiſh nation had the mortification to ſee thoſe whom they ſtyled *rebels* and *traitors*, ſucceed in negociations in which they themſelves were utterly foiled. In the paſſing of the Quebec-bill, miniſtry had flattered themſelves that the Canadians would be ſo much attached to them on account of reſtoring the French laws, that they would very readily join in any attempt againſt the coloniſts who had reprobated that bill in ſuch ſtrong terms: but in this, as in every thing elſe indeed, they found themſelves miſtaken. The Canadians having been ſubject to Britain for a period of 15 years, and being thus rendered ſenſible of the advantages of Britiſh government, received the bill itſelf with evident marks of diſapprobation; nay, reprobated it as tyrannical and oppreſſive. A ſcheme had been formed for General Carleton, governor of the province, to raiſe an army of Canadians wherewith to act againſt the Americans; and ſo ſanguine were the hopes of adminiſtration in this reſpect, that they had ſent 20,000 ſtand of arms, and a great quantity of military ſtores, to Quebec for the purpoſe. But the people, though they did not join the Americans, yet were found immoveable in their purpoſe to ſtand neuter. Application was made to the biſhop; but he declined to interpoſe his influence, as contrary to the rules of the Popiſh clergy: ſo that the utmoſt efforts of government in this province were found to anſwer little or no purpoſe.

190
Miniſtry attempt in vain to arm the Indians.

The Britiſh adminiſtration next tried to engage the Indians in their cauſe. But though agents were diſperſed among them with large preſents to the chiefs, they univerſally replied, that they did not underſtand the nature of the quarrel, nor could they diſtinguiſh whether thoſe who dwelt in America or on the other ſide of the ocean were in fault: but they were ſurpriſed to ſee Engliſhmen aſk their aſſiſtance againſt one another; and adviſed them to be reconciled, and not to think of ſhedding the blood of their brethren.—To the repreſentations of congreſs they paid more reſpect. Theſe ſet forth, that the Engliſh on the other ſide of the ocean, had taken up arms to enſlave, not only their countrymen in America, but the Indians alſo; and if the latter ſhould enable them to overcome the coloniſts, they themſelves would ſoon be reduced to a ſtate of ſlavery alſo. By arguments of this kind theſe ſavages were engaged to remain neuter; and thus the coloniſts were freed from a moſt dangerous enemy. On this occaſion the congreſs thought proper to hold a ſolemn conference with the different tribes of Indians. The ſpeech made by them on the occaſion is curious, but too long to be fully inſerted. The following is a ſpecimen of the European mode of addreſſing theſe people.

191
Speech of the commiſſioners from congreſs to the Indians.

"Brothers, Sachems, and Warriors!

"We the delegates from the Twelve United Provinces, now ſitting in general congreſs at Philadelphia, ſend their talk to you our brothers.

"Brothers and Friends, now attend!

"When our fathers croſſed the great water, and came over to this land, the king of England gave them a talk, aſſuring them ~~that~~ they and their children ſhould be his children; and that if they would leave their native country, and make ſettlements, and live here, and buy and ſell, and trade with their brethren beyond the water, they ſhould ſtill keep hold of the ſame covenant-chain, and enjoy peace; and it was covenanted, that the fields, houſes, goods, and poſſeſſions, which our fathers ſhould acquire, ſhould remain to them as their own, and be their childrens for ever, and at their ſole diſpoſal.

"Brothers and Friends, open an ear!

"We will now tell you of the quarrel betwixt the counſellors of King George and the inhabitants and colonies of America.

"Many of his counſellors have perſuaded him to break the covenant-chain, and not to ſend us any more good talks. They have prevailed upon him to enter into a covenant againſt us, and have torn aſunder, and caſt behind their backs, the good old covenant which their anceſtors and ours entered into, and took ſtrong hold of. They now tell us they will put their hands into our pocket without aſking, as though it were their own; and at their pleaſure they will take from us our charters, or written civil conſtitution, which we love as our lives; alſo our plantations, our houſes, and our goods, whenever they pleaſe, without aſking our leave. They tell us that our veſſels may go to that or this iſland in the ſea, but to this or that particular iſland we ſhall not trade any more; and in caſe of our non-compliance with theſe new orders, they ſhut up our harbours.

"Brothers, we live on the ſame ground with you; the ſame iſland is our common birth-place. We deſire to ſit down under the ſame tree of peace with you: let us water its roots, and cheriſh the growth, till the large leaves and flouriſhing branches ſhall extend to the ſetting ſun, and reach the ſkies. If any thing diſagreeable ſhould ever fall out between us, the Twelve United Colonies, and you, the Six Nations, to wound our peace, let us immediately ſeek meaſures for healing the breach. From the preſent ſituation of our affairs, we judge it expedient to kindle up a ſmall fire at Albany, where we may hear each other's voice, and diſcloſe our minds fully to one another."

The other remarkable tranſactions of this congreſs were the ultimate refuſal of the conciliatory propoſal made by Lord North, of which ſuch ſanguine expectations had been formed by the Engliſh miniſtry; and appointing a generaliſſimo to command their armies, which were now very numerous. The perſon choſen for this purpoſe was **George Washington**: a man ſo univerſally beloved, that he was raiſed to ſuch a high ſtation by the unanimous voice of congreſs; and his ſubſequent conduct ſhowed him every way worthy of it. Horace Gates and Charles Lee, two Engliſh officers of conſiderable reputation, were alſo choſen; the former an adjutant-general, the ſecond a major-general. Artemus Ward, Philip Schuyler, and Iſrael Putnam, were likewiſe nominated major-generals. Seth Pomeroy, Richard Montgomery, David Wooſter, William Heath, Joſeph Spencer, John Thomas, John Sullivan, and Nathaniel Green, were choſen brigadier-generals at the ſame time.

192
General Waſhington appointed commander in chief.

193
Georgia accedes to the confederacy.

Congreſs had now alſo the ſatisfaction to receive deputies from the colony of Georgia, expreſſing a deſire to join the confederacy. The reaſons they gave for renouncing their allegiance to Britain was, that the conduct of parliament towards the other colonies had been oppreſſive; that though the obnoxious acts had not been extended to them, they could view this only as an omiſſion, becauſe of the ſeeming little conſequence of their colony; and therefore looked upon it rather to be a ſlight than a favour. At the ſame time they framed a petition to the king, ſimilar to that ſent by the other colonies, and which met with a ſimilar reception.

194
The Americans attempt the conqueſt of Canada.

The ſucceſs which had hitherto attended the Americans in all their meaſures, now emboldened them to think not only of defending themſelves, but likewiſe of acting offenſively againſt Great-Britain. The conqueſt of Canada appeared an object within their reach, and one that would be attended with many advantages; and as an invaſion of that province was already facilitated by the taking of Crown-Point and Ticonderoga, it was reſolved if poſſible to penetrate that way into Canada, and reduce Quebec during the winter, before the fleets and armies which they were well aſſured would ſail thither from Britain ſhould arrive. By order of congreſs, therefore, 3000 men were put under the command of Generals Montgomery and Schuyler, with orders to proceed to Lake Champlain, from whence they were to be conveyed in flat-bottomed boats to the mouth of the river Sorel, a branch of the great river St. Lawrence, and on which is ſituated a fort of the ſame name with the river. On the other hand, they were oppoſed by General Carleton, governor of Canada, a man of great activity and experience in war; who, with a very few troops, had hitherto been able to keep in awe the diſaffected people of Canada, notwithſtanding all the repreſentations of the coloniſts. He had now augmented his army by a conſiderable number of Indians, and promiſed, even in his preſent ſituation, to make a very formidable reſiſtance.

As ſoon as General Montgomery arrived at Crown-Point, he received information that ſeveral armed veſſels were ſtationed at St. John's, a ſtrong fort on the

Sorel, with a view to prevent his croſſing the lake; on which he took poſſeſſion of an iſland which commands the mouth of the Sorel, and by which he could prevent them from entering the lake. In conjunction with General Schuyler, he next proceeded to St John's: but finding that place too ſtrong, it was agreed in a council of war, to retire to Iſle aux Noix, where General Schuyler being taken ill, Montgomery was left to command alone. His firſt ſtep was to gain over the Indians whom Gen. Carleton had employed, and this he in a great meaſure accompliſhed; after which, on receiving the full number of troops appointed for his expedition, he determined to lay ſiege to St John's. **195 Chamblee taken.** In this he was facilitated by the reduction of Chamblee, a ſmall fort in the neighbourhood, where he found a large ſupply of powder. An attempt was made by General Carleton to relieve the place; for which purpoſe he with great pains collected about 1000 Canadians, while Colonel Maclean propoſed to raiſe a regiment of the Highlanders who had emigrated from their own country to America.

196 Gen. Carleton defeated.

But while Gen. Carleton was on his march with theſe new levies, he was attacked by the provincials, and utterly defeated; which being made known to another body of Canadians who had joined Colonel Maclean, they abandoned him without ſtriking a blow, and he was obliged to retreat to Quebec.

The defeat of General Carleton was a ſufficient recompence to the Americans for that of Colonel Ethan Allen, which had happened ſome time before. The ſucceſs which had attended this gentleman againſt Crown-Point and Ticonderago had emboldened him to make a ſimilar attempt on Montreal; but being attacked by the militia of the place, ſupported by a detachment of regulars, he was entirely defeated and taken priſoner.

As the defeat of General Carleton and the deſertion of Maclean's forces left no room for the garriſon of St John's to hope for any relief, they now conſented to ſurrender themſelves priſoners of war; but were in other reſpects treated with great humanity. **197 St John's fort taken,** They were in number 500 regulars and 200 Canadians, among whom were many of the French nobility, who had been very active in promoting the cauſe of Britain among their countrymen.

General Montgomery next took meaſures to prevent the Britiſh ſhipping from paſſing down the river from Montreal to Quebec. This he accompliſhed ſo effectually, that the whole were taken. **198 And likewiſe Montreal.** The town itſelf was obliged to ſurrender at diſcretion; and it was with the utmoſt difficulty that General Carleton eſcaped in an open boat by the favour of a dark night.

No further obſtacle now remained in the way of the Americans to the capital, except what aroſe from the nature of the country; and theſe indeed were very conſiderable. Nothing, however, could damp the ardour of the provincials. **199 Col. Arnold penetrates into Canada.** Notwithſtanding it was now the middle of November, and the depth of winter was at hand, Colonel Arnold formed a deſign of penetrating through woods, moraſſes, and the moſt frightful ſolitudes from New-England to Canada by a nearer way than that which Montgomery had choſen; and this he accompliſhed in ſpite of every difficulty, to the aſtoniſhment of all who ſaw or heard of the attempt. A third part of his men under another colonel had been obliged to leave him by the way, for want of proviſions; the total want of artillery rendered his preſence inſignificant before a place ſtrongly fortified; and the ſmallneſs of his army rendered it even doubtful whether he could have taken the town by ſurpriſe. The Canadians indeed were amazed at the exploit, and their inclination to revolt from Britain was ſomewhat augmented; but none of them as yet took up arms in behalf of America. The conſternation into which the town of Quebec was thrown proved detrimental rather than otherwiſe to the expedition; as it doubled the vigilance and activity of the inhabitants to prevent any ſurpriſe; and the appearance of common danger united all parties, who, before the arrival of Arnold, were contending moſt violently with one another. He was therefore obliged to content himſelf with blocking up the avenues to the town, in order to diſtreſs the garriſon for want of proviſions; and even this he was unable to do effectually, by reaſon of the ſmall number of his men.

The matter was not much mended by the arrival of General Montgomery. The force he had with him, even when united to that of Arnold, was too inſignificant to attempt the reduction of a place ſo ſtrongly fortified, eſpecially with the aſſiſtance only of a few mortars and field-pieces. **200 Attempt to ſurpriſe Quebec.** After the ſiege had continued through the month of December, General Montgomery, conſcious that he could accompliſh his end no other way than by ſurpriſe, reſolved to make an attempt on the laſt day of the year 1775. The method he took at this time was perhaps the beſt that human wiſdom could deviſe. He advanced by break of day, in the midſt of an heavy fall of ſnow, which covered his men from the ſight of the enemy. Two real attacks were made by himſelf and Colonel Arnold, at the ſame time that two feigned attacks were made on two other places, thus to diſtract the garriſon, and make them divide their forces. One of the real attacks was made by the people of New-York, and the other by thoſe of New-England under Arnold. Their hopes of ſurpriſing the place, however, were defeated by the ſignal for the attack being through ſome miſtake given too ſoon. General Montgomery himſelf had the moſt dangerous place, being obliged to paſs between the river and ſome high rocks on which the Upper Town ſtands; ſo that he was forced to make what haſte he could to cloſe with the enemy. His fate, however, was now decided. **201 Gen. Montgomery killed, and the Americans defeated.** Having forced the firſt barrier, a violent diſcharge of muſketry and grape-ſhot from the ſecond killed him, his principal officers, and the moſt of the party he commanded; on which thoſe who remained immediately retreated. Colonel Arnold, in the mean time, made a deſperate attack on the Lower Town, and carried one of the barriers after an obſtinate reſiſtance for an hour; but in the action he himſelf received a wound, which obliged him to withdraw. The attack, however, was continued by the officers whom he had left, and another barrier forced: but the garriſon, now perceiving that nothing was to be feared except from that quarter, collected their whole force againſt it; and, after a deſperate engagement of three hours, overpowered the provincials, and obliged them to ſurrender.

In this action, it muſt be confeſſed that the valour of the provincial troops could not be exceeded. They had fought under as great diſadvantages as thoſe which attended the Britiſh at Bunker's Hill, and had behaved equally well. Such a terrible diſaſter left no hope remaining of the accompliſhment of their purpoſe, as General Arnold could now ſcarce number 800 effective men under his command. He did not, however, abandon the province, or even remove to a greater diſtance than three miles from Quebec; and here he ſtill found means to annoy the garriſon very conſiderably by intercepting their proviſions. The Canadians, notwithſtanding the bad ſucceſs of the American arms, ſtill continued friendly; and thus he was enabled to ſuſtain the hardſhips of a winter-encampment in that moſt ſevere climate. The congreſs, far from paſſing any cenſure on him for his misfortune, created him a brigadier-general.

202
Arnold created a Brigadier-General.

203
Diſputes of Lord Dunmore with his province of Virginia.

While hoſtilities were thus carried on with vigour in the north, the flame of contention was gradually extending itſelf in the ſouth. Lord Dunmore, the governor of Virginia, was involved in diſputes ſimilar to thoſe which had taken place in other colonies. Theſe had proceeded ſo far that the aſſembly was diſſolved; which in this province was attended with a conſequence unknown to the reſt. As Virginia contained a great number of ſlaves, it was neceſſary that a militia ſhould be kept conſtantly on foot to keep them in awe. During the diſſolution of the aſſembly the militia-laws expired; and the people, after complaining of the danger they were in from the negroes, formed a convention, which enacted that each county ſhould raiſe a quota for the defence of the province. Dunmore, on this, removed the powder from Williamſburg; which created ſuch diſcontents, that an immediate quarrel would probably have enſued, had not the merchants of the town undertaken to obtain ſatisfaction for the injury ſuppoſed to be done to the community. This tranquillity, however, was ſoon interrupted; the people, alarmed by a report that an armed party were on their way from the man of war where the powder had been depoſited, aſſembled in arms, and determined to oppoſe by force any farther removals. In ſome of the conferences which paſſed at this time, the governor let fall ſome unguarded expreſſions, ſuch as threatening them with ſetting up the royal ſtandard, proclaiming liberty to the negroes, deſtroying the town of Williamſburg, &c. which were afterwards made public, and exaggerated in ſuch a manner as greatly to increaſe the public ferment.

The people now held frequent aſſemblies. Some of them took up arms with a deſign to force the governor to reſtore the powder, and to take the public money into their own poſſeſſion: but on their way to Williamſburg for this purpoſe, they were met by the receiver-general, who became ſecurity for the payment of the gun-powder, and the inhabitants promiſed to take care of the magazine and public revenue.

204
He ſends his family aboard a man of war.

By this inſurrection the governor was ſo much intimidated, that he ſent his family on board a man of war. He himſelf, however, iſſued a proclamation, in which he declared the behaviour of the perſon who promoted the tumult treaſonable, accuſed the people of diſaffection, &c. On their part they were by no means deficient in recriminating; and ſome letters of his to Britain being about the ſame time diſcovered, conſequences enſued extremely ſimilar to thoſe which had been occaſioned by thoſe of Mr Hutchinſon at Boſton.

205
Fortifies his palace.

In this ſtate of confuſion the governor thought it neceſſary to fortify his palace with artillery, and procure a party of marines to guard it. Lord North's conciliatory propoſal arriving alſo about the ſame time, he uſed his utmoſt endeavours to cauſe the people comply with it. The arguments he uſed were plauſible; and, had not matters already gone to ſuch a pitch of diſtraction, it is highly probable that ſome attention would have been paid to them. "The view (he ſaid) in which the colonies ought to behold this conciliatory propoſal, was no more than an earneſt admonition from Great-Britain to relieve her wants: that the utmoſt condeſcendence had been uſed in the mode of application; no determinate ſum having been fixed, as it was thought moſt worthy of Britiſh generoſity to take what they thought could be conveniently ſpared, and likewiſe to leave the mode of raiſing it to themſelves," &c. But the clamour and diſſatisfaction were now ſo univerſal, that nothing elſe could be attended to. The governor had called an aſſembly for the purpoſe of laying this conciliatory propoſal before them; but it had been little attended to. The aſſembly began their ſeſſion by inquiries into the ſtate of the magazine. It had been broken into by ſome of the townſmen; for which reaſon ſpring-guns had been placed there by the governor, which diſcharged themſelves upon the offenders at their entrance: theſe circumſtances, with others of a ſimilar kind, raiſed ſuch a violent uproar, that, as ſoon as the preliminary buſineſs of the ſeſſion was over, the governor retired on board a man of war, informing the aſſembly that he durſt no longer truſt himſelf on ſhore. This produced a long courſe of diſputation, which ended in a poſitive refuſal of the governor to truſt himſelf again in Williamſburg, even to give his aſſent to the bills, which could not be paſſed without it, and though the aſſembly offered to bind themſelves for his perſonal ſafety. In his turn he requeſted them to meet him on board the man of war, where he then was; but his propoſal was rejected, and all further correſpondence containing the leaſt appearance of friendſhip was diſcontinued.

206
His arguments for L. North's conciliatory plan.

207
The governor retires on board a man of war.

208
Attempts to reduce the colony by force.

Lord Dunmore, having thus abandoned his government, attempted to reduce by force thoſe whom he could no longer govern. Some of the moſt ſtrenuous adherents to the Britiſh cauſe, whom their zeal had rendered obnoxious at home, now repaired to him. He was alſo joined by numbers of black ſlaves. With theſe, and the aſſiſtance of the Britiſh ſhipping, he was for ſome time enabled to carry on a kind of predatory war ſufficient to hurt and exaſperate, but not to ſubdue. After ſome inconſiderable attempts on land, proclaiming liberty to the ſlaves, and ſetting up the royal ſtandard, he took up his reſidence at Norfolk, a maritime town of ſome conſequence, where the people were better affected to Britain than in moſt other places. A conſiderable force, however, was collected againſt him; and the natural impetuoſity of his temper prompting him to act againſt them with more courage than caution, he was entirely defeated, and obliged to retire to his ſhipping, which was now crowded by the number of thoſe who had incurred the reſentment of the provincials.

209
But is entirely defeated.

210
Mr Conolly's plan for reducing Virginia.

In the mean time a ſcheme of the utmoſt magnitude and importance was formed by one Mr Conolly, a Penſylvanian,

ſylvanian, attached to the cauſe of Britain. The firſt ſtep of this plan was to enter into a league with the Ohio Indians. This he communicated to Lord Dunmore, and it received his approbation: Upon which Conolly ſet out, and actually ſucceeded in his deſign. On his return he was diſpatched to General Gage, from whom he received a colonel's commiſſion, and ſet out in order to accompliſh the remainder of his ſcheme. The plan in general was, that he ſhould return to the Ohio, where, by the aſſiſtance of the Britiſh and Indians in theſe parts, he was to penetrate through the back ſettlements into Virginia, and join Lord Dunmore at Alexandria. But by an accident very naturally to be expected, he was diſcovered, taken priſoner, and confined.

211
He is diſcovered and taken priſoner.

212
The town of Norfolk deſtroyed.

After the retreat of Lord Dunmore from Norfolk, that place was taken poſſeſſion of by the provincials, who greatly diſtreſſed thoſe on board Lord Dunmore's fleet, by refuſing to ſupply them with any neceſſaries. This proceeding drew a remonſtrance from his Lordſhip; in which he inſiſted that the fleet ſhould be furniſhed with neceſſaries; but his requeſt being denied, a reſolution was taken to ſet fire to the town. After giving the inhabitants proper warning, a party landed, under cover of a man of war, and ſet fire to that part which lay neareſt the ſhore; but the flames were obſerved at the ſame time to break forth in every other quarter, and the whole town was reduced to aſhes. This univerſal deſtruction, occaſioned a loſs of more than L. 300,000.

213
The governors of South and North Carolina expelled.

In the ſouthern colonies of Carolina, the governors were expelled, and obliged to take refuge on board of men of war, as Lord Dunmore had been; Mr Martin, governor of North Carolina, on a charge of attempting to raiſe the back-ſettlers, conſiſting chiefly of Scots Highlanders, againſt the colony. Having ſecured themſelves againſt any attempts from theſe enemies, however, they proceeded to regulate their internal concerns in the ſame manner as the reſt of the colonies; and by the end of the year 1775, Britain beheld the whole of America united againſt her in the moſt determined oppoſition. Her vaſt poſſeſſions of that tract of land (ſince known by the name of the *Thirteen United States*) were now reduced to the ſingle town of Boſton; in which her forces were beſieged by an enemy with whom they were apparently not able to cope, and by whom they muſt of courſe expect in a very ſhort time to be expelled. The ſituation of the inhabitants of Boſton, indeed, was peculiarly unhappy. After having failed in their attempts to leave the town, general Gage had conſented to allow them to retire with their effects; but afterwards, treacherouſly refuſed to fulfil his promiſe. When he reſigned his place to general Howe in October 1775, the latter, apprehenſive that they might give intelligence of the ſituation of the Britiſh troops, ſtrictly prohibited any perſon from leaving the place under pain of military execution. Thus matters continued till the month of March 1776, when the town was evacuated.

214
Miſerable ſituation of the inhabitants of Boſton.

215
Boſton ſeverely cannonaded by the provincials.

On the 2d of that month, General Waſhington opened a battery on the weſt ſide of the town, from whence it was bombarded, with a heavy fire of cannon at the ſame time; and three days after, it was attacked by another battery from the eaſtern ſhore. This terrible attack continued for 14 days without intermiſſion; when General Howe, finding the place no longer tenable, determined if poſſible to drive the enemy from their works. Preparations were therefore made for a moſt vigorous attack, on an hill called Dorcheſter Neck, which the Americans had fortified in ſuch a manner as would in all probability have rendered the enterprize next to deſperate. No difficulties, however, were ſufficient to daunt the ſpirit of the general; and every thing was in readineſs, when a ſudden ſtorm prevented an exertion which muſt have been productive of a dreadful waſte of blood. Next day, upon a more cloſe inſpection of the works they were to attack, it was thought adviſable to deſiſt from the enterprize altogether. The fortifications were very ſtrong, and extremely well provided with artillery; and, beſides other implements of deſtruction, upwards of 100 hogſheads of ſtones were provided to roll down upon the enemy as they came up; which, as the aſcent was extremely ſteep, muſt have done prodigious execution.

216
The place evacuated.

Nothing therefore now remained but to think of a retreat; and even this was attended with the utmoſt difficulty and danger. The Americans, however, knowing that it was in the power of the Britiſh general to reduce the town to aſhes, which could not have been repaired in many years, did not think proper to give the leaſt moleſtation; and for the ſpace of a fortnight the troops were employed in the evacuation of the place, from whence they carried along with them 2000 of the inhabitants, who durſt not ſtay on account of their attachment to the Britiſh cauſe. From Boſton they ſailed to Halifax; but all their vigilance could not prevent a number of valuable ſhips from falling into the hands of the enemy. A conſiderable quantity of cannon and ammunition had alſo been left at Bunker's Hill and Boſton Neck; and in the town, an immenſe variety of goods, principally woollen and linen, of which the provincials ſtood very much in need. The eſtates of thoſe who fled to Halifax were confiſcated; as alſo thoſe who were attached to government, and had remained in the town. As an attack was expected as ſoon as the Britiſh forces ſhould arrive, every method was employed to render the fortifications, already very ſtrong, impregnable. For this purpoſe ſome foreign engineers were employed, who had before arrived at Boſton; and ſo eager were people of all ranks to accompliſh this buſineſs, that every able-bodied man in the place, without diſtinction of rank, ſet apart two days in the week, to complete it the ſooner.

217
Its fortifications ſtrengthened.

218
Congreſs declare th States of America independent.

The Americans, exaſperated to the utmoſt by the proceedings of parliament, which placed them out of the royal protection, and engaged foreign mercenaries in the plan for ſubduing them, now formally renounced all connection with Britain, and declared themſelves independent. This celebrated declaration was publiſhed on the 4th of July 1776. Previous to this a circular letter had been ſent through each colony, ſtating the reaſons for it; and ſuch was the animoſity now every where prevailing againſt Great-Britain, that it met with univerſal approbation, except in the province of Maryland alone. It was not long, however, before the people of that colony, finding themſelves left in a very dangerous minority, thought proper to accede to the meaſures of the reſt. The manifeſto itſelf was in the uſual nervous ſtyle, ſtating a long liſt of grievances, for which redreſs had been often applied in vain; and for theſe reaſons they determined on a final ſeparation; to hold the people of Britain as the reſt of mankind, "enemies in war, in peace friends."

After thus publicly throwing off all allegiance and hope of reconciliation, the coloniſts ſoon found that an exertion of all their ſtrength was required in order and ſupport their pretenſions. Their arms, indeed, had not, during this ſeaſon, been attended with ſucceſs in Canada. Reinforcements had been promiſed to Colonel Arnold, who ſtill continued the blockade of Quebec; but they did not arrive in time to ſecond his operations.

219
The ſiege of Quebec ſtill continued.

Being ſenſible, however, that he muſt either deſiſt from the enterprize, or finiſh it ſucceſsfully, he recommenced in form; attempting to burn the ſhipping, and even to ſtorm the town itſelf. They were unſucceſsful, however, by reaſon of the ſmallneſs of their number, though they ſucceeded ſo far as to burn a number of houſes in the ſuburbs; and the garriſon were obliged to pull down the remainder, in order to prevent the fire from ſpreading.

220
Canadians defeated by the provincials;

As the provincials, though unable to reduce the town, kept the garriſon in continual alarms, and in a very diſagreeable ſituation, ſome of the nobility collected themſelves into a body under the command of one Mr Beaujeu, in order to relieve their capital; but they were met on their march by the provincials, and ſo entirely defeated, that they were never afterwards able to attempt any thing. The Americans, however, had but little reaſon to plume themſelves on this ſucceſs. Their want of artillery at laſt convinced them, that it was impracticable in their ſituation to reduce a place ſo ſtrongly fortified; the ſmall-pox at the ſame time made its appearance in their camp, and carried off great numbers; intimidating the reſt to ſuch a degree, that they deſerted in crowds. To add to their misfortunes, the Britiſh reinforcements unexpectedly appeared, and the ſhips made their way through the ice with ſuch celerity, that the one part of their army was ſeparated from the other; and

221
Who are in their turn defeated by General Carleton.

General Carleton ſallying out as ſoon as the reinforcement was landed, obliged them to fly with the utmoſt precipitation, leaving behind them all their cannon and military ſtores; at the ſame time that their ſhipping was entirely captured by veſſels ſent up the river for that purpoſe. On this occaſion the provincials fled with ſuch precipitation that they could not be overtaken; ſo that none fell into the hands of the Britiſh, excepting the ſick and wounded.

222
Humanity of the Britiſh general

General Carleton now gave a ſignal inſtance of his humanity: Being well appriſed that many of the provincials had not been able to accompany the reſt in their retreat, and that they were concealed in woods, &c. in a very deplorable ſituation, he generouſly iſſued a proclamation, ordering proper perſons to ſeek them out, and give them relief at the public expence; at the ſame time leſt, through fear of being made priſoners, they ſhould refuſe theſe offers of humanity, he promiſed that, as ſoon as their ſituation enabled them, they ſhould be at liberty to depart to their reſpective homes.

223
He purſues the provincials.

The Britiſh general, now freed from any danger of an attack, was ſoon enabled to act offenſively againſt the provincials, by the arrival of the forces deſtined for that purpoſe from Britain. By theſe he was put at the head of 12,000 regular troops, among whom were thoſe of Brunſwick. With this force he inſtantly ſet out to the Three Rivers, where he expected that Arnold would have made a ſtand; but he had retired to Sorel, a place 150 miles diſtant from Quebec, where he was at laſt met by the reinforcements ordered by congreſs. Here, though the preceding events were by no means calculated to inſpire much military ardour, a very daring enterpriſe was undertaken; and this was, to ſurpriſe the Britiſh troops poſted here under Generals Fraſer and Neſbit; of whom the former commanded thoſe on land, the latter ſuch as were on board of tranſports and were but a little way diſtant. The enterpriſe was undoubtedly very hazardous, both on account of the ſtrength of the parties againſt whom they were to act, and as the main body of the Britiſh forces were advanced within 50 miles of the place; beſides that a number of armed veſſels and tranſports with troops lay between them and the Three Rivers.

224
General Thomſon defeated and taken priſoner by General Fraſer.

Two thouſand choſen men, however, under General Thomſon, engaged in this enterpriſe. Their ſucceſs was by no means anſwerable to their ſpirit and valour. Though they paſſed the ſhipping without being obſerved, General Fraſer had notice of their landing; and thus being prepared to receive them, they were ſoon thrown into diſorder, at the ſame time that General Neſbit, having landed his forces, prepared to attack them in the rear. On this occaſion ſome field-pieces did prodigious execution, and a retreat was found to be unavoidable. General Neſbit, however, had got between them and their boats; ſo that they were obliged to take a circuit through a deep ſwamp, while they were hotly purſued by both parties at the ſame time, who marched for ſome miles on each ſide of the ſwamp, till at laſt the unfortunate provincials were ſheltered from further danger by a wood at the end of the ſwamp. Their general, however, was taken, with 200 of his men.

225
The provincials purſued by Gen. Burgoyne;

By this diſaſter the provincials loſt all hopes of accompliſhing any thing in Canada. They demoliſhed their works, and carried off their artillery with the utmoſt expedition. They were purſued, however, by General Burgoyne; againſt whom it was expected that they would have collected all their force, and made a reſolute ſtand. But they were now too much diſpirited by misfortune, to make any further exertions of valour. On the 18th of June the Britiſh general arrived at Fort St John's, which he found abandoned and burnt. Chamblee had ſhared the ſame fate, as well as all the veſſels that were not capable of being dragged up againſt the current of the river.

226
But eſcape to Crown-Point.

It was thought that they would have made ſome reſiſtance at Nut-Iſland, the entrance to Lake Champlain; but this alſo they had abandoned, and retreated acroſs the lake to Crown-Point, whither they could not be immediately followed. Thus was the province of Canada entirely evacuated by the Americans; whoſe loſs in their retreat from Quebec was not calculated at leſs than 1000 men, of whom 400 fell at once into the hands of the enemy at a place called the Cedars, about 50 miles above Montreal. General Sullivan, however, who conducted this retreat after the affair of General Thomſon, had great merit in what he did, and received the thanks of congreſs accordingly.

This bad ſucceſs in the north, however, was ſomewhat compenſated by what happened in the ſouthern colonies.—We have formerly taken notice that Mr Martin, 227 An inſurrection in North-Carolina in favour of Britain.

Martin, governor of North-Carolina, had been obliged to leave his province and take refuge on board a man of war. Notwithſtanding this, he did not deſpair of reducing it again to obedience. For this purpoſe he applied to the Regulators, a daring ſet of banditti, who lived in a kind of independent ſtate; and though conſidered by government as rebels, yet had never been moleſted, on account of their numbers and known ſkill in the uſe of fire-arms. To the chiefs of theſe people commiſſions were ſent, in order to raiſe ſome regiments; and a Colonel Macdonald was appointed to command them. In the month of February he erected the king's ſtandard, iſſued proclamations, &c. and collected ſome forces, expecting to be ſoon joined by a body of regular troops, who were known to be ſhipped from Britain to act againſt the ſouthern colonies. The Americans, ſenſible of their danger, diſpatched immediately what forces they had to act againſt the royaliſts, at the ſame time that they diligently exerted themſelves to ſupport theſe with ſuitable reinforcements. Their preſent force was commanded by a General Moore, whoſe numbers were inferior to Macdonald; for which reaſon the latter ſummoned him to join the king's ſtandard under pain of being treated as a rebel. But Moore, being well provided with cannon, and conſcious that nothing could be attempted againſt him, returned the compliment, by acquainting Colonel Macdonald, that if he and his party would lay down their arms, and ſubſcribe an oath of fidelity to congreſs, they ſhould be treated as friends; but if they perſiſted in an undertaking for which it was evident they had not ſufficient ſtrength, they could not but expect the ſevereſt treatment. In a few days General Moore found himſelf at the head of 8000 men, by reaſon of the continual ſupplies which daily arrived from all parts. The royal party amounted only to 2000, and they were deſtitute of artillery, which prevented them from attacking the enemy while they had the advantage of numbers. They were now therefore obliged to have recourſe to a deſperate exertion of perſonal valour; by dint of which they effected a retreat for near 80 miles to Moore's Creek, within 16 miles of Wilmington. Could they have gained this place, they expected to have been joined by Governor Martin and General Clinton, who had lately arrived with a conſiderable detachment. But Moore with his army purſued them ſo cloſe, that they were obliged to attempt the paſſage of the creek itſelf, though a conſiderable body of the enemy, under the comand of Colonel Caſwell, with fortifications well planted with cannon, was poſted on the other ſide. 228 The royaliſts entirely defeated. On attempting the creek, however, it was found not to be fordable. They were obliged therefore to croſs over a wooden bridge, which the provincials had not time to deſtroy entirely. They had, however, by pulling up part of the planks, and greaſing the remainder in order to render them ſlippery, made the paſſage ſo difficult, that the royaliſts could not attempt it. In this ſituation they were, on the 27th of February, attacked by Moore with his ſuperior army, and totally defeated with the loſs of their general and moſt of their leaders, as well as the beſt and braveſt of their men.

229 Lord Dunmore finally driven out of Virginia.

Thus was the power of the provincials eſtabliſhed in North-Carolina. Nor were they leſs ſucceſsful in the province of Virginia; where Lord Dunmore, having long continued an uſeleſs predatory war, was at laſt driven from every creek and road in the province. The people he had on board were diſtreſſed to the higheſt degree by confinement in ſmall veſſels. The heat of the ſeaſon, and the numbers crowded together, produced a peſtilential fever, which made great havock, eſpecially among the blacks. At laſt, finding themſelves in the utmoſt hazard of periſhing by famine as well as diſeaſe, they ſet fire to the leaſt valuable of their veſſels, reſerving only about 50 for themſelves, in which they bid a final adieu to Virginia, ſome ſailing to Florida, ſome to Bermuda, and the reſt to the Weſt-Indies.

230 Britiſh armament ſent againſt Charleſton.

In South-Carolina the provincials had a more formidable enemy to deal with. A ſquadron, whoſe object was the reduction of Charleſton, had been fitted out in December 1775; but by reaſon of unfavourable weather did not reach Cape Fear in North-Carolina, till the month of May 1776: and here it met with further obſtacles till the end of the month. Thus the Americans, always noted for their alertneſs in raiſing fortifications, had time to ſtrengthen thoſe of Charleſton in ſuch a manner as rendered it extremely difficult to be attacked. The Britiſh ſquadron conſiſted of two 50 gun ſhips, four of 30 guns, two of 20, and an armed ſchooner and bomb-ketch; all under the command of Sir Peter Parker. The land forces were commanded by Lord Cornwallis, with Generals Clinton and Vaughan. As they had yet no intelligence of the evacuation of Boſton, General Howe diſpatched a veſſel to Cape-Fear with ſome inſtructions; but it was too late; and in the beginning of June the ſquadron anchored off Charleſton bar. Here they met with ſome difficulty in croſſing, being obliged to take out the guns from the two largeſt ſhips, which were, notwithſtanding, ſeveral times in danger of ſticking faſt. The next obſtacle was a ſtrong fort on Sullivan's iſland, ſix miles eaſt from Charleſton; which, though not completely finiſhed, was very ſtrong. However, the Britiſh generals reſolved without heſitation to attack it; but though an attack was eaſy from the ſea, it was very difficult to obtain a co-operation of the land forces. This was attempted by landing them on Long-Iſland, adjacent to Sullivan's iſland on the eaſt, from which it is ſeparated by a very narrow creek, ſaid not to be above two feet deep at low water. Oppoſite to this ford the provincials had poſted a ſtrong body of troops, with cannon and intrenchments; while General Lee was poſted on the main land, with a bridge of boats betwixt that and Sullivan's-Iſland, ſo that he could at pleaſure ſend reinforcements to the troops in the fort on Sullivan's-Iſland.

On the part of the Britiſh, ſo many delays occurred, that it was the 24th of June before matters were in readineſs for an attack; and by this time the provincials had abundantly provided for their reception. On the morning of that day the bomb-ketch began to throw ſhells into Fort Sullivan, and about mid-day the two 50 gun ſhips and 30 gun frigates came up and began a ſevere fire. Three other frigates were ordered to take their ſtation between Charleſton and the fort, in order to enfilade the batteries, and cut off the communication with the main land; but through the ignorance of the pilots they all ſtuck faſt; and though two

America.

of them were diſentangled, they were found to be totally unfit for ſervice: the third was burnt, that ſhe might not fall into the hands of the enemy.

231
The fleet make a furious attack

The attack was therefore confined to the five armed ſhips and bomb-ketch, between whom and the fort a dreadful fire enſued. The Briſtol ſuffered exceſſively. The ſprings on her cable being ſhot away, ſhe was for ſome time entirely expoſed to the enemy's fire. As the enemy poured in great quantities of red-hot balls, ſhe was twice in flames. The captain (Mr Morris) after receiving five wounds, was obliged to go below deck in order to have his arm amputated. After undergoing this operation he returned to his place, where he received another wound, but ſtill refuſed to quit his ſtation: at laſt he received a red-hot ball in his belly, which inſtantly put an end to his life. Of all the officers and ſeamen who ſtood on the quarter-deck of this veſſel, not one eſcaped without a wound excepting Sir Peter Parker alone; whoſe intrepidity and preſence of mind on this occaſion was very remarkable.

232
Bravery of Captain Morris.

233
The Britiſh repulſed.

The engagement laſted till darkneſs put an end to it. Little damage was done by the Britiſh, as the works of the enemy lay ſo low that many of the ſhot flew over; and the fortifications, being compoſed of palm-trees mixed with earth, were extremely well calculated to reſiſt the impreſſion of cannon. During the height of the attack, the provincial batteries remained for ſome time ſilent, ſo that it was concluded that they had been abandoned; but this was found to proceed only from want of powder; for as ſoon as a ſupply of this neceſſary article was obtained, the firing was reſumed as briſk as before. During the whole of this deſperate engagement it was found impoſſible for the land forces to give the leaſt aſſiſtance to the fleet. The enemy's works were found to be much ſtronger than they had been imagined, and the depth of water effectually prevented them from making any attempt. In this unſucceſsful attack the killed and wounded on the part of the Britiſh amounted to about 200. The Briſtol and Experiment were ſo much damaged, that it was thought they could not have been got over the bar; however, this was at laſt accompliſhed by a very great exertion of naval ſkill, to the ſurpriſe of the provincials, who had expected to make them both prizes. On the American ſide the loſs was judged to have been conſiderable.

234
Americans form a navy.

This year alſo, the Americans, having ſo frequently made trial of their valour by land, became deſirous of trying it by ſea alſo, and of forming a navy that might in ſome meaſure be able to protect their trade, and do eſſential hurt to the enemy. In the beginning of March, Commodore Hopkins was diſpatched with five frigates to the Bahama iſlands, where he made himſelf maſter of the ordinance and military ſtores; but the gunpowder, which had been the principal object, was removed. On his return he captured ſeveral veſſels; but was foiled in his attempt on the Glaſgow frigate, which found means to eſcape, notwithſtanding the efforts of his whole ſquadron.

The time, however, was now come when the fortitude and patience of the Americans were to undergo a ſevere trial. Hitherto they had been on the whole ſucceſsful in their operations: but now they were doomed to experience misfortune, miſery, and diſappointment; the enemy over-running their country, and their own armies not able to face them in the field. The province of New-York, as being the moſt central colony, and moſt acceſſible by ſea, was pitched upon for the object of the main attack. The force ſent againſt it conſiſted of 6 ſhips of the line, 30 frigates, beſides other armed veſſels, and a vaſt number of tranſports. The fleet was commanded by Lord Howe, and the land forces by his brother General Howe, who was now at Halifax. The latter, however, a conſiderable time before his brother arrived, had ſet ſail from Halifax, and lay before New-York, but without attempting to commence hoſtilities until he ſhould be joined by his brother. The Americans had, according to cuſtom, fortified New-York and the adjacent iſlands in an extraordinary manner. However, General Howe was ſuffered to land his troops on Staten Iſland, where he was ſoon joined by a number of the inhabitants. About the middle of July, Lord Howe arrived with the grand armament; and being one of the commiſſioners appointed to receive the ſubmiſſion of the coloniſts, he publiſhed a circular letter to this purpoſe to the ſeveral governors who had lately been expelled from their provinces, deſiring them to make the extent of his commiſſion, and the powers he was inveſted with by parliament, as public as poſſible. Here, however, congreſs ſaved him trouble, by ordering his letter and declaration to be publiſhed in all the newſpapers, "That every one might ſee the inſidiouſneſs of the Britiſh miniſtry, and that they had nothing to truſt to beſides the exertion of their own valour."

235
Armament ſent againſt New-York.

236
General Howe lands on Staten Iſland.

237
General Waſhington refuſes a letter from Lord Howe.

Lord Howe next ſent a letter to General Waſhington; but as it was directed "To George Waſhington, Eſq;" the General refuſed to accept of it, as not being directed in the ſtyle ſuitable to his ſtation. To obviate this objection, Adjutant-general Patterſon was ſent with another letter, directed "To George Waſhington, &c. &c. &c." But though a very polite reception was given to the bearer, General Waſhington utterly refuſed the letter; nor could any explanation of the Adjutant induce him to accept of it. The only intereſting part of the converſation was that relating to the powers of the commiſſioners, of whom Lord Howe was one. The adjutant told him, that theſe powers were very extenſive: that the commiſſioners were determined to exert themſelves to the utmoſt, in order to bring about a reconciliation; and that he hoped the General would conſider this viſit as a ſtep towards it. General Waſhington replied, that it did not appear that theſe powers conſiſted in any thing elſe than granting pardons; and as America had committed no offence, ſhe aſked no forgiveneſs, and was only defending her unqueſtionable rights.

238
Hoſtilities commence.

The deciſion of every thing being now by conſent of both parties left to the ſword, no time was loſt, but hoſtilities commenced as ſoon as the Britiſh troops could be collected. This, however, was not done before the month of Auguſt; when they landed without any oppoſition on Long-Iſland, oppoſite to the ſhore of Staten-Iſland. General Putnam, with a large body of troops, lay encamped and ſtrongly fortified on a peninſula on the oppoſite ſhore, with a range of hills between the armies, the principal paſs of which was near a place called *Flat-buſh*. Here the centre of the Britiſh army, conſiſting of Heſſians, took poſt; the left wing, under General Grant, lying near the ſhore; and

239
Situation of the Britiſh and American armies.

240
The Americans defeated with great ſlaughter.

and the right, conſiſting of the greater part of the Britiſh forces, lay under Lord Percy, Cornwallis, and General Clinton. Putnam had ordered the paſſes to be ſecured by large detachments, which was executed as to thoſe at hand; but one of the utmoſt importance, that lay at a diſtance, was entirely neglected. This gave an opportunity to a large body of troops under Lord Percy and Clinton to paſs the mountains and attack the Americans in the rear, while they were engaged with the Heſſians in front. Through this piece of negligence their defeat became inevitable. Thoſe who were engaged with the Heſſians firſt perceived their miſtake, and began a retreat towards their camp; but the paſſage was intercepted by the Britiſh troops, who drove them back into the woods. Here they were met by the Heſſians; and thus were they for many hours ſlaughtered between the two parties, no way of eſcape remaining but by breaking through the Britiſh troops, and thus regaining their camp. In this attempt many periſhed; and the right wing, engaged with General Grant, ſhared the ſame fate. The victory was complete; and the Americans loſt on this fatal day (Auguſt 27th) conſiderably upwards of 1000 men, and two generals: ſeveral officers of diſtinction were made priſoners, with a number of privates. Among the ſlain, a regiment, conſiſting of young gentlemen of fortune and family in Maryland, was almoſt entirely cut in pieces, and of the ſurvivors not one eſcaped without a wound.

The ardour of the Britiſh troops was now ſo great, that they could ſcarce be reſtrained from attacking the lines of the provincials; but for this there was now no occaſion, as it was certain they could not be defended. Of the Britiſh and Heſſians about 450 were loſt in this engagement.

241
They abandon their camp in the night.

As none of the American commanders thought it proper to riſk another attack, it was reſolved to abandon their camp as ſoon as poſſible. Accordingly, on the night of the 29th of Auguſt, the whole of the continental troops were ferried over with the utmoſt ſecrecy and ſilence; ſo that in the morning the Britiſh had nothing to do but take poſſeſſion of the camp and artillery which they had abandoned.

242
Lord Howe ſends a meſſage to congreſs,

243
And is waited on by a committee.

This victory, though complete, was very far from being ſo deciſive as the conquerors imagined. Lord Howe, ſuppoſing that it would be ſufficient to intimidate the congreſs into ſome terms, ſent General Sullivan, who had been taken priſoner in the late action, to congreſs, with a meſſage, importing, that though he could not conſiſtently treat with them as a legal aſſembly, yet he would be very glad to confer with any of the members in their private capacity; ſetting forth at the ſame time the nature and extent of his powers as commiſſioner. But the congreſs were not ſo humbled as to derogate in the leaſt from the dignity of character they had aſſumed. They replied, that the congreſs of the free and independent ſtates of America could not conſiſtently ſend any of its members in another capacity than that which they had publicly aſſumed; but as they were extremely deſirous of reſtoring peace to their country upon equitable conditions, they would appoint a committee of their body to wait upon him, and learn what propoſals he had to make.

244
The conference terminates ineffectually.

245
New-York abandoned by the provincials.

This produced a new conference. The committtee appointed by congreſs was compoſed of Dr Franklin, Mr Adams, and Mr Rutledge. They were very politely received by his Lordſhip; but the conference proved as fruitleſs as before independency had been declared; and the final anſwer of the deputies was, that they were extremely willing to enter into any treaty with Great Britain that might conduce to the good of both nations, but that they would not treat in any other character than that of independent ſtates. This poſitive declaration inſtantly put an end to all hopes of reconciliation; and it was reſolved to proſecute the war with the utmoſt vigour. Lord Howe, after publiſhing a manifeſto, in which he declared the refuſal of congreſs, and that he himſelf was willing to confer with all well diſpoſed perſons about the means of reſtoring public tranquillity, ſet about the moſt proper methods for reducing the city of New-York. Here the provincial troops were poſted, and from a great number of batteries kept continually annoying the Britiſh ſhipping. The Eaſt River lay between them, of about 1200 yards in breadth, which the Britiſh troops were extremely deſirous of paſſing. At laſt, the ſhips having, after an inceſſant cannonade of ſeveral days, ſilenced the moſt troubleſome batteries, a body of troops was ſent up the river to a bay, about three miles diſtant, where the fortifications were leſs ſtrong than in other places. Here, having driven off the provincials by the cannon of the fleet, they marched directly towards the city; but the enemy finding that they ſhould now be attacked on all ſides, abandoned the city, and retired to the north of the iſland, where their principal force was collected. In their paſſage thither they ſkirmiſhed with the Britiſh, but carefully avoided a general engagement; and it was obſerved that they did not behave with that ardour and impetuous valour which had hitherto marked their character.

246
Situation of the Britiſh and American armies.

The Britiſh and provincial armies were not now above two miles diſtant from each other. The former lay encamped from ſhore to ſhore for an extent of two miles, being the breadth of the iſland, which, though 15 miles long, exceeds not two in any part in breadth. The provincials, who lay directly oppoſite, had ſtrengthened their camp with many fortifications; at the ſame time being maſters of all the paſſes and defiles betwixt the two camps, they were enabled to defend themſelves againſt an army much more numerous than their own; and they had alſo ſtrongly fortified a paſs called *King's-Bridge*, whence they could ſecure a paſſage to the continent in caſe of any misfortune. Here General Waſhington, in order to inure the provincials to actual ſervice, and at the ſame time to annoy the enemy as much as poſſible, employed his troops in continual ſkirmiſhes; by which it was obſerved that they ſoon recovered their ſpirits, and behaved with their uſual boldneſs.

247
New-York ſet on fire.

As the ſituation of the two armies was now highly inconvenient for the Britiſh generals, it was reſolved to make ſuch movements as might oblige General Waſhington to relinquiſh his ſtrong ſituation. The poſſeſſion of New-York had been leſs beneficial than was expected. A few days after it was evacuated by the Americans, a dreadful fire broke out, occaſioned, probably, by the licentious conduct of ſome of its new maſters, and had it not been for the active exertions of the ſailors and ſoldiery, the whole town might have been conſumed, the wind being high, and the weather remarkably dry. About a thouſand houſes were deſtroyed.

ed. General Howe having left Lord Percy with ſufficient force to garriſon New-York, he embarked his army in flat-bottomed boats by which they were conveyed through the dangerous paſſage called *Hell-Gate*, and landed near the town of Weſt-Cheſter, lying on the continent towards Connecticut. Here having received a ſupply of men and proviſions, they moved to New-Rochelle, ſituated on the ſound which ſeparates Long-Iſland from the continent. After this, receiving ſtill freſh reinforcements, they made ſuch movements as threatened to diſtreſs the provincials very much by cutting off their convoys of proviſions from Connecticut, and thus force them to an engagement. This, however, General Waſhington determined at all events to avoid.

248 General Waſhington obliged to move farther from New-York.

He therefore extended his forces into a long line oppoſite to the way in which the enemy marched, keeping the Bruna, a river of conſiderable magnitude, between the two armies, with the North-River on his rear. Here again the provincials continued for ſome time to annoy and ſkirmiſh with the royal army, until at laſt, by ſome other manœuvres, the Britiſh general found means to attack them advantageouſly at a place called the *White-Plains*, and drove them from ſome of their poſts.

249 Is defeated at the White Plains.

The ſucceſs on this occaſion was much leſs complete than the former; however it obliged the provincials once more to ſhift their ground, and to retreat farther up the country. General Howe purſued for ſome time; but at laſt finding all his endeavours vain to bring the Americans to a pitched battle, he determined to give over ſuch an uſeleſs chace, and employ himſelf in reducing the forts which the provincials ſtill retained in the neighbourhood of New-York. In this he met with the moſt complete ſucceſs. The Americans, on the approach of the king's forces, retreated from King's-Bridge into Fort-Waſhington; and this, as well as Fort-Lee, which lay in the neighbourhood, was quickly reduced, though the garriſon made their eſcape.

250 The Jerſeys entirely over-run by the Britiſh troops.

Thus the Jerſeys were laid entirely open to the incurſions of the Britiſh troops, and ſo fully were theſe provinces taken poſſeſſion of by the royal army, that its winter-quarters extended from New-Brunſwick to the river Delaware. Had any number of boats been at hand, it was thought Philadelphia would now have fallen into their hands. All theſe, however, had been carefully removed by the Americans.

251 Rhode-Iſland taken.

In lieu of this enterpriſe, Sir Henry Clinton undertook an expedition to Rhode-Iſland, and became maſter of it without loſing a man. His expedition was alſo attended with this further advantage, that the American fleet under commodore Hopkins was obliged to ſail as far as poſſible up the river Providence, and thus remained entirely uſeleſs.

The ſame ill ſucceſs continued to attend the Americans in other parts. After their expulſion from Canada, they had croſſed the lake Champlain, and taken up their quarters at Crown-Point, as we have already mentioned. Here they remained for ſome time in ſafety, as the Britiſh had no veſſels on the lake, and conſequently general Burgoyne could not purſue them. To remedy this deficiency, there was no poſſible method, but either to conſtruct veſſels on the ſpot, or take to pieces ſome veſſels already conſtructed, and drag them up the river into the lake.

252 The Britiſh convey veſſels up the lake Champlain.

This, however, was effected in no longer a ſpace than three months; and the Britiſh general, after incredible toil and difficulty, ſaw himſelf in poſſeſſion of a great number of veſſels, by which means he was enabled to purſue his enemies, and invade them in his turn. The labour undergone at this time by the ſea and land forces muſt indeed have been prodigious; ſince there were conveyed over land, and dragged up the rapids of St Lawrence, no fewer than thirty large long-boats, 400 batteaux, beſides a vaſt number of flat-bottomed boats, and a gondola of 30 tons. The intent of the expedition was to puſh forward, before winter, to Albany, where the army would take up its winter-quarters, and next ſpring effect a junction with that under General Howe, when it was not doubted that the united force and ſkill of theſe two commanders would ſpeedily put a termination to the war.

By reaſon of the difficulties with which the equipment of this fleet had been attended, it was the beginning of October before the expedition could be undertaken. It was now, however, by every judge, allowed to be completely able to anſwer the purpoſe for which it was intended. It conſiſted of one large veſſel with three maſts, carrying 18 twelve-pounders; two ſchooners, the one carrying 14, the other 12 ſix-pounders; a large flat-bottomed radeau with 6 twenty-four and 6 twelve-pounders; and a gondola with 8 nine pounders. Beſides theſe, were 20 veſſels of a ſmaller ſize, called *gun-boats*, carrying each a piece of braſs ordnance from nine to twenty-four pounders, or howitzers. Several long-boats were fitted out in the ſame manner; and beſides all theſe, there was a vaſt number of boats and tenders of various ſizes to be uſed as tranſports for the troops and baggage. It was manned by a number of ſelect ſeamen, and the guns were to be ſerved by a detachment from the corps of artillery; the officers and ſoldiers appointed for this expedition were alſo choſen out of the whole army.

253 Deſtroy the naval force of the provincials.

To oppoſe this formidable armament the Americans had only a very inconſiderable force, commanded by general Arnold; who, after engaging part of the Britiſh fleet for a whole day, took advantage of the darkneſs of the night to ſet ſail without being perceived, and next morning was out of ſight: but he was ſo hotly purſued by the Britiſh, that on the ſecond day after, he was overtaken, and forced to a ſecond engagement. In this he behaved with great gallantry; but his force being very inferior to that of the enemy, he was obliged to run his ſhips aſhore and ſet them on fire. A few only eſcaped to lake George; and the garriſon of Crown-Point having deſtroyed or carried off every thing of value, retired to Ticonderago. Thither general Carleton intended to have purſued them; but the difficulties he had to encounter appeared ſo many and ſo great, that it was thought proper to march back into Canada, and deſiſt from any further operations till next ſpring.

254 The Americans almoſt entirely diſperſed.

Thus the affairs of the Americans ſeemed every where going to wreck: even thoſe who had been moſt ſanguine in their cauſe began to waver. The time, alſo, for which the ſoldiers had enliſted themſelves was now expired; and the bad ſucceſs of the preceding campaign had been ſo very diſcouraging, that no perſon was willing to engage himſelf during the continuance of a war of which the event ſeemed to be ſo doubtful. In conſequence of this, therefore, General Waſhington found his army daily decreaſing in ſtrength; ſo that from 30,000, of which it conſiſted when general Howe landed on Staten Iſland, ſcarce a tenth-part could now be muſtered. To aſſiſt the chief commander as much as poſſible, general Lee had collected a body of forces in the north; but on his way ſouthward, having imprudently taken up his lodging at ſome diſtance from his troops, information was given to colonel Harcourt, who happened at that time to be in the neighbourhood, and Lee was made priſoner.

255
General Lee taken priſoner.

The loſs of this general was much regretted, the more eſpecially as he was of ſuperior quality to any priſoner in the poſſeſſion of the coloniſts, and could not therefore be exchanged. Six field-officers were offered in exchange for him, and refuſed; and the congreſs was highly irritated at its being reported that he was to be treated as a deſerter, having been a half-pay officer in the Britiſh ſervice at the commencement of the war. In conſequence of this they iſſued a proclamation, threatening to retaliate on the priſoners in their poſſeſſion whatever puniſhment ſhould be inflicted on any of thoſe taken by the Britiſh, and eſpecially that their conduct ſhould be regulated by the treatment of general Lee.

256
Continental army for 1777.

In the mean time they proceeded with the moſt indefatigable diligence to recruit their army, and bound their ſoldiers to ſerve for a term of three years, or during the continuance of the war. The army deſigned for the enſuing campaign, was to conſiſt of 88 battalions; of which each province was to contribute its quota; and 20 dollars were offered as a bounty to each ſoldier, beſides an allotment of lands at the end of the war. In this allotment it was ſtipulated, that each ſoldier ſhould have 100 acres; an enſign 150; a lieutenant 200; a captain 300; a major 400; a lieutenant-colonel 450; and a colonel 509. No lands were promiſed to thoſe who enliſted only for three years. All officers or ſoldiers diſabled through wounds received in the ſervice were to enjoy half-pay during life. To defray the expence, congreſs borrowed five millions of dollars at five per cent.; for payment of which the United States became ſurety. At the ſame time, in order to animate the people to vigorous exertions, a declaration was publiſhed, in which they ſet forth the neceſſity there was for taking proper methods to inſure ſucceſs in their cauſe: they endeavoured to palliate as much as poſſible the misfortunes which had already happened; and repreſented the true cauſe of the preſent diſtreſs to be the ſhort term of enliſtment.

This declaration, together with the imminent danger of Philadelphia, determined the Americans to exert themſelves to the utmoſt in order to reinforce general Waſhington's army. They ſoon received farther encouragement, however, by an exploit of that general againſt the Heſſians. As the Royal army extended in different cantonments for a great way, general Waſhington, perceiving the imminent danger to which Philadelphia was expoſed, reſolved to make ſome attempt on thoſe diviſions of the enemy which lay neareſt that city. Theſe happened to be the Heſſians, who lay in three diviſions, the laſt only 20 miles diſtant from Philadelphia. On the 25th of December, having collected as conſiderable a force as he could, he ſet out with an intent to ſurpriſe that body of the enemy which lay at Trenton. His army was divided into three bodies; one of which he ordered to croſs the Delaware at Trenton Ferry, a little below the town: the ſecond at a good diſtance below, at a place called *Bordentown*, where the ſecond diviſion of Heſſians was placed; while he himſelf, with the third, directing his courſe to a ferry ſome miles above Trenton, intended to have paſſed it at midnight, and attack the Heſſians at break of day. But by reaſon of various impediments, it was eight in the morning before he could reach the place of his deſtination. The enemy, however, did not perceive his approach till they were ſuddenly attacked. Colonel Ralle, who commanded them, did all that could be expected from a brave and experienced officer; but every thing was in ſuch confuſion, that no efforts of valour or ſkill could now retrieve matters. The Colonel himſelf was mortally wounded, his troops were entirely broken, their artillery ſeized, and about 1000 taken priſoners. After this gallant exploit, General Waſhington again returned into Penſylvania.

This action, though ſeemingly of no very deciſive nature, was ſufficient at that time to turn the fortune of war in favour of America. It tended greatly to leſſen the apprehenſions which the provincials had of the Heſſians, at the ſame time that it equally abated the confidence which the Britiſh had till now put in them.

Reinforcements came in from ſeveral quarters to General Waſhington, ſo that he was ſoon in a condition once more to paſs the Delaware, and take up his quarters at Trenton, where he was emboldened to maintain his ſtation, notwithſtanding the accounts that were received of the enemy's rapid advance towards him. Lord Cornwallis, accordingly, made his appearance in full force; and, on the evening of his arrival, the little town of Trenton contained the two hoſtile armies, ſeparated only by a ſmall creek, which was fordable in many places. This was, indeed the criſis of the American revolution; and had his Lordſhip made an immediate attack, in purſuance of what is reported to have been the advice of Sir William Erſkine, General Waſhington's defeat ſeems to have been inevitable: but a night's delay turned the fate of the war, and produced an enterpriſe, the magnitude and glory of which, can only be equalled by its ſucceſs. General Waſhington having called a council of war, ſtated the calamitous ſituation to which his army was reduced; and having heard the various opinions of his officers, finally propoſed a circuitous march to Princeton, as the means of avoiding, at once, the imputation of a retreat, and the danger of a battle, with numbers ſo inferior, and in a ſituation ſo ineligible. The idea was unanimouſly approved; and, as ſoon as it was dark, the neceſſary meaſures were taken for accompliſhing it. A line of fires was kindled, which ſerved to give light to the Americans, while it obſcured them from the obſervation of the enemy: and by a providential interpoſition, the weather, which had been for ſome time paſt warm, moiſt, and foggy, ſuddenly changed to a hard froſt; and, in a moment as it were, rendered the road, which had been deep and heavy, firm and ſmooth as a pavement.

257
Britiſh defeated at Princeton;

At break of day General Waſhington arriving near Princeton, was diſcovered by a party of Britiſh troops, conſiſting of three regiments under the command of Col. Mawhood, who were on their march to Trenton. With theſe the centre of the Americans engaged, and after killing 60, wounding many, and taking 300 priſoners, obliged the reſt to make a precipitate

258
And retreat to Brunſwick.

tate eſcape, ſome towards Trenton, and others in a retrograde rout to Brunſwick. The loſs of the Americans was inconſiderable in point of numbers; but the fall of the amiable General Mercer rendered it important. The Britiſh aſtoniſhed and diſcouraged at the ſucceſs and ſpirit of theſe repeated enterprizes, abandoning both Trenton and Princeton, retreated to Brunſwick; while the triumphant Americans retired to Morris-town. General Waſhington, however, omitted no opportunity of recovering what had been loſt; and by dividing his army into ſmall parties, which could be reunited on a few hours warning, he in a manner entirely covered the country with it, and repoſſeſſed himſelf of all the important places.

Thus ended the campaign of 1776, with ſcarce any other real advantage than the acquiſition of the city of New York, and of a few fortreſſes in its neighbourhood; where the troops were conſtrained to act with as much circumſpection as if they had been beſieged by a victorious army, inſtead of being themſelves the conquerors.

259
Excurſions of the Britiſh from New York.

The army at New-York began in 1777 to exerciſe a kind of predatory war, by ſending out parties to deſtroy magazines, make incurſions, and take or deſtroy ſuch forts as lay on the banks of rivers, to which their great command of ſhipping gave them acceſs. In this they were generally ſucceſsful: the provincial magazines at Peek's Hill, a place about 50 miles diſtant from New-York, were deſtroyed, the town of Dunbury in Connecticut burnt, and that of Ridgefield in the ſame province was taken poſſeſſion of. In returning from the laſt expedition, however, the Britiſh were greatly harraſſed by the enemy under Generals Arnold, Wooſter, and Sullivan; but they made good their retreat in ſpite of all oppoſition, with the loſs of only 170 killed and wounded. On the American ſide the loſs was much greater; General Wooſter was killed, and Arnold in the moſt imminent danger. On the other hand, the Americans deſtroyed the ſtores at Stagg-harbour, in Long-Iſland, and made priſoners of all who defended the place.

260
General Preſcot taken priſoner.

As this method of making war, however, could anſwer but little purpoſe, and ſavoured more of the barbarous incurſions of ſavages than of a war carried on by a civilized people, it was reſolved to make an attempt on Philadelphia. At firſt it was thought that this could be done through the Jerſeys; but the cruelties exerciſed by the Britiſh plundering parties had excited ſo general an abhorrence, and General Waſhington had received ſuch large reinforcements, and poſted himſelf ſo ſtrongly, that it was found to be impracticable. Many ſtratagems were uſed to draw him from his ſtrong ſituation, but without ſucceſs; ſo that it was found neceſſary to make the attempt on Philadelphia by ſea. While the preparations neceſſary for this expedition were going forward, the Americans found means to make amends for the capture of General Lee by that of General Preſcot, who was ſeized in his quarters with his aid de camp, in much the ſame manner as General Lee had been. This was exceedingly mortifying to the General himſelf, as he had not long before ſet a price upon General Arnold, by offering a ſum of money to any one that apprehended him; which the latter anſwered by ſetting a lower price upon General Preſcot.

261
The fleet ſails for Philadelphia.

The month of July was far advanced before the preparations for the expedition againſt Philadelphia were completed; and it was the 23d before the fleet was able to ſail from Sandy Hook. The force employed in this expedition conſiſted of 36 battalions of Britiſh and Heſſians, a regiment of light horſe, and a body of loyaliſts raiſed at New-York. The remainder of theſe, with 17 battalions, and another body of light horſe, were ſtationed at New-York under Sir Henry Clinton. Seven battalions were ſtationed at Rhode-Iſland. After a week's ſailing they arrived at the mouth of the Delaware; but there having received certain intelligence, that the navigation of the river was ſo effectually obſtructed, that no poſſibility of forcing a paſſage remained; or more probably that Gen. Waſhington had marched within a ſhort diſtance of Philadelphia; it was reſolved to proceed further ſouthward to Cheſapeak Bay in Maryland, from whence the diſtance to Philadelphia was not very great, and where the provincial army would find leſs advantage from the nature of the country than in the Jerſeys.

262
The army lands at the head of the Elk.

263
Americans defeated.

The navigation from Delaware to Cheſapeak took up the beſt part of the month of Auguſt, and that up the bay itſelf was extremely difficult and tedious. At laſt, having ſailed up the river Elk, as far as was practicable, the troops were landed without oppoſition, and ſet forward on their intended expedition. On the news of their arrival at Cheſapeak, General Waſhington left the Jerſeys, and haſtened to the relief of Philadelphia; and in the beginning of September met the royal army at Brandy-wine Creek about mid-day, between the head of the Elk and Philadelphia. Here he adhered to his former method of ſkirmiſhing and haraſſing the royal army on its march; but as this proved inſufficient to ſtop its progreſs, he retired to that ſide of the Creek next to Philadelphia, with an intent to diſpute the paſſage. This brought on a general engagement on the 11th September, in which the Americans were worſted; and it was perhaps, only through the approach of night that they were ſaved from being entirely deſtroyed. On this occaſion the provincials loſt about 1000 in killed and wounded, beſides 400 taken priſoners. The celebrated Marquis de la Fayette here firſt bled in the cauſe of liberty, which he had eſpouſed with enthuſiaſtic ardor. His wound was ſlight, but it endeared him to the Americans.

264
An American detachment ſurpriſed and defeated with great ſlaughter.

The loſs of this battle proved alſo the loſs of Philadelphia. General Waſhington retired towards Lancaſter, an inland town, at a conſiderable diſtance from Philadelphia. But though he could not prevent the loſs of Philadelphia, he ſtill adhered to his original plan of diſtreſſing the royal party, by laying ambuſhes and cutting off detached parties; but in this he was leſs ſucceſsful than formerly; and one of his own detachments which lay in ambuſh in a wood were themſelves ſurpriſed and entirely defeated, with the loſs of 300 killed and wounded, beſides 70 or 80 taken, and all their arms and baggage.

265
General Howe takes poſſeſſion of Philadelphia.

General Howe now perceiving that the Americans would not venture another battle even for the ſake of their capital, took peaceable poſſeſſion of it on the 26th of September. His firſt care was then to cut off, by means of ſtrong batteries, the communication between the upper and lower parts of the river; which was executed, notwithſtanding the oppoſition of ſome American armed veſſels; one of which, carrying 36 guns, was taken. His next taſk was to open a communication with it by ſea; and this was a work of no ſmall difficulty. A vaſt number of batteries and forts had been erected, and immenſe machines formed like *chevaux de frize*, from whence they took their name, ſunk in the river to prevent its navigation. As the fleet was ſent round to the mouth of the river in order to co-operate with the army, this work, however difficult, was accompliſhed; nor did the provincials give much oppoſition, as well knowing that all places of this kind were now untenable.

266 Royal army attacked at German-town.

General Waſhington, however, took the advantage of the royal army being divided to attack the camp of the principal diviſion of it that lay at German town, in the neighbourhood of Philadelphia. In this he met with very little ſucceſs; for though he reached the place of deſtination by three o'clock in the morning, the patroles had time to call the troops to arms.

267 The Americans repulſed.

The Americans, notwithſtanding, made a very reſolute attack: but they were received with ſo much bravery, that they were compelled to abandon the attempt, and retreat in great diſorder; with the advantage, however, of carrying off their cannon, though purſued for a conſiderable way, after having upwards of 200 killed, and about 500 wounded, and upwards of 400 taken priſoners, among whom were 54 officers. On the Britiſh ſide, the loſs amounted to 430 wounded and priſoners, and 70 killed; but among the laſt were General Agnew and Colonel Bird, with ſome other excellent officers.

There ſtill remained two ſtrong forts on the Delaware to be reduced. Theſe were, Mud-Iſland and Red-Bank. The various obſtructions which the Americans had thrown in the way rendered it neceſſary to bring up the Auguſta, a ſhip of the line, and the Merlin frigate, to the attack of Mud-Iſland; but during the heat of action both were grounded. Upon this, the Americans ſent down four fire-ſhips, and directed the whole fire from their galleys againſt them.

268 The Britiſh ſhips of war burnt.

The former were rendered ineffectual by the courage and ſkill of the Britiſh ſeamen; but during the engagement both the Auguſta and Merlin took fire and were burnt to aſhes, and the other ſhips obliged to withdraw. The enemy, encouraged by this unſucceſsful attempt, proceeded to throw new obſtructions in the way; but the Britiſh general having found means to convey a number of cannon and to erect batteries within a gunſhot of the fort by land, and bringing up three ſhips of the line which mounted heavy cannon, the garriſon, after making a vigorous defence for one day, perceiving that preparations were making for a general aſſault on the next, abandoned the place in the night.

269 All the forts near Philadelphia reduced.

Thoſe who defended Red-Bank followed their example, and abandoned it on the approach of Lord Cornwallis. A great number of the American ſhipping now finding themſelves entirely deſtitute of any protection, ſailed up the river in the night-time. Seventeen, however, remained, whoſe retreat was intercepted by a frigate and ſome armed veſſels; on which the Americans ran them aſhore and burnt them, to prevent their falling into the enemy's hands.

Thus the campaign of 1777, in Penſylvania, concluded, upon the whole, ſucceſsfully on the part of the Britiſh. In the north, however, matters wore a different aſpect. The expedition in that quarter had been projected by the Britiſh miniſtry as the moſt effectual method that could be taken to cruſh the colonies at once.

270 Expedition projected againſt New-England.

The four provinces of New-England had originally begun the confederacy againſt Britain, and were ſtill conſidered as the moſt active in the continuation of it; and it was thought, that any impreſſion made upon them, would contribute in an effectual manner to the reduction of all the reſt. For this purpoſe, an army of 4000 choſen Britiſh troops and 3000 Germans were put under the command of General Burgoyne; General Carleton was directed to uſe his intereſt with the Indians to perſuade them to join in this expedition; and the province of Quebec was to furniſh large parties to join in the ſame. The officers who commanded under General Burgoyne were, General Philips of the artillery, Generals Fraſer, Powell, and Hamilton, with the German officers Generals Reideſel and Speecht. The ſoldiers, as has already been obſerved, were all excellently diſciplined, and had been kept in their winter-quarters with all imaginable care, in order to prepare them for the expedition on which they were going. To aid the principal expedition, another was projected on the Mohawk River under Colonel St Leger, who was to be aſſiſted by Sir John Johnſon, ſon to the famous Sir William Johnſon who had ſo greatly diſtinguiſhed himſelf in the war of 1755.

271 General Burgoyne joined by the Indians.

On the 21ſt of June 1777, the army encamped on the weſtern ſide of the Lake Champlain; where, being joined by a conſiderable body of Indians, General Burgoyne made a ſpeech, in which it is ſaid he exhorted theſe new allies, but ineffectually, to lay aſide their ferocious and barbarous manner of making war; to kill only ſuch as oppoſed them in arms; and to ſpare priſoners, with ſuch women and children as ſhould fall into their hands.

272 Ticonderago beſieged and taken.

After iſſuing a proclamation, in which the force of Britain, and that which he commanded, was ſet forth in very oſtentatious terms, the campaign opened with the ſiege of Ticonderago. The place was very ſtrong, and garriſoned by 6000 men under General Sinclair; nevertheleſs, the works were ſo extenſive, that even this number was ſcarce ſufficient to defend them properly. They had therefore omitted to fortify a rugged eminence called *Sugar-Hill*, the top of which overlooked and effectually commanded the whole works; imagining, perhaps, that the difficulty of the aſcent would be ſufficient to prevent the enemy from taking poſſeſſion of it. On the approach of the firſt diviſion of the army, the provincials abandoned and ſet fire to their outworks; and ſo expeditious were the Britiſh troops, that by the 5th of July every poſt was ſecured which was judged neceſſary for inveſting it completely. A road was ſoon after made to the very ſummit of that eminence which the Americans had ſuppoſed could not be aſcended; and ſo much were they now diſheartened, that they inſtantly abandoned the fort entirely, taking the road to Skeneſborough, a place to the ſouth of Lake George; while their baggage, with what artillery and military ſtores they could carry off, were ſent to the ſame place by water. But the Britiſh generals were determined not to let them paſs ſo eaſily.

273 Americans defeated by land and water.

Both were purſued and both overtaken. Their armed veſſels conſiſted only of five galleys; two of which were taken, and three blown up; on which they ſet fire to their boats and fortifications at Skeneſborough. On this occaſion the provincials loſt 200 boats, 130 pieces of cannon, with all their proviſions and baggage. Their land-forces under Colonel Francis made a brave defence againſt General Fraſer; and ſuperior in number, had almoſt overpowered him, when General Reideſel with a large body of Germans came to his aſſiſtance. The enemy were now overpowered in their turn; and their commander being killed, they fled on all ſides with great precipitation. In this action 200 Americans were killed, as many taken priſoners, and above 600 wounded, many of whom periſhed in the woods for want of aſſiſtance.

During the engagement General Sinclair was at Caſtleton, about ſix miles from the place; but inſtead of going forward to Fort Anne, the next place of ſtrength, he repaired to the woods which lie between that fortreſs and New-England. General Burgoyne, however, detached Colonel Hill with the ninth regiment, in order to intercept ſuch as ſhould attempt to retreat towards Fort Anne. On his way he met with a body of the enemy, ſaid to be ſix times as numerous as his own; but after an engagement of three hours, they were obliged to retire with great loſs. After ſo many diſaſters, deſpairing of being able to make any ſtand at Fort Anne, they ſet fire to it and retired to Fort Edward. In all theſe engagements the loſs of killed and wounded in the royal army did not exceed 200 men.

274
They are again defeated, and abandon Fort Anne.

General Burgoyne was now obliged to ſuſpend his operations for ſome time, and wait at Skeneſborough for the arrival of his tents, proviſions, &c. but employed this interval in making roads through the country about St Anne, and in clearing a paſſage for his troops to proceed againſt the enemy. This was attended with incredible toil; but all obſtacles were ſurmounted with equal patience and reſolution by the army. In ſhort, after undergoing the utmoſt difficulty that could be undergone, and making every exertion that man could make, he arrived with his army before Fort Edward about the end of July. Here General Schuyler had been for ſome time endeavouring to recruit the ſhattered American forces, and had been joined by General Sinclair with the remains of his army; the garriſon of Fort George alſo, ſituated on the lake of that name, had evacuated the place and retired to Fort Edward.

275
General Burgoyne makes his way to Fort Edward with great difficulty.

276
Americans retire to Saratoga.

But on the approach of the royal army, they retired from thence alſo, and formed their head-quarters at Saratoga. Notwithſtanding the great ſucceſſes of the Britiſh general, they ſhowed not the leaſt diſpoſition to ſubmit, but ſeemed only to conſider how they might make the moſt effectual reſiſtance. For this purpoſe, the militia was every where raiſed and draughted to join the army at Saratoga; and ſuch numbers of volunteers were daily added, that they ſoon began to recover from the alarm into which they had been thrown. That they might have a commander whoſe abilities could be relied on, General Arnold was appointed, who repaired to Saratoga with a conſiderable train of artillery; but receiving intelligence that Colonel St Leger was proceeding with great rapidity in his expedition on the Mohawk River, he removed to Still water, a place about half-way between Saratoga and the junction of the Mohawk and Hudſon's River. The Colonel, in the mean time, had advanced as far as Fort Stanwix; the ſiege of which he preſſed with great vigour. On the 6th of Auguſt, underſtanding that a ſupply of proviſions, eſcorted by 800 or 900 men, was on the way to the fort, he diſpatched Sir John Johnſon with a ſtrong detachment to intercept it. This he did ſo effectually, that, beſides intercepting the proviſions, 400 of its guard were ſlain, 200 taken, and the reſt eſcaped with great difficulty. The garriſon, however, were not to be intimidated by this diſaſter, nor by the threats or repreſentations of the Colonel: on the contrary, they made ſeveral ſucceſsful ſallies under Colonel Willet, the ſecond in command; and this gentleman, in company with another, even ventured out of the fort, and, eluding the vigilance of the enemy, paſſed through them in order to haſten the march of General Arnold to their aſſiſtance.

277
Fort Stanwix beſieged.

278
A detachment of Americans cut in pieces.

279
The Indians deſert and force the colonel to raiſe the ſiege.

Thus the affairs of Colonel St Leger ſeemed to be in no very favourable ſituation notwithſtanding his late ſucceſs, and they were ſoon totally ruined by the deſertion of the Indians. They had been alarmed by the report of General Arnold's advancing with 2000 men to the relief of the fort; and while the Colonel was attempting to give them encouragement, another report was ſpread, that General Burgoyne had been defeated with great ſlaughter, and was now flying before the provincials. On this he was obliged to do as they thought proper; and the retreat could not be effected without the loſs of the tents and ſome of the artillery and military ſtores.

280
General Burgoyne diſtreſſed for want of proviſions.

General Burgoyne, in the mean time, notwithſtanding all the difficulties he had already ſuſtained, found that he muſt ſtill encounter more. The roads he had made with ſo much labour and pains were deſtroyed, either by the wetneſs of the ſeaſon or by the enemy; ſo that the proviſions he brought from Fort George could not arrive at his camp without the moſt prodigious toil. On hearing of the ſiege of Fort Stanwix by Colonel St Leger, he determined to move forward, in hopes of incloſing the enemy betwixt his own army and that of St Leger, or of obtaining the command of all the country between Fort Stanwix and Albany; or, at any rate, a junction with Colonel St Leger would be effected, which could not but be attended with the moſt happy conſequences. The only difficulty was the want of proviſions; and this it was propoſed to remedy by reducing the provincial magazines at Bennington. For this purpoſe, Colonel Baum, a German officer of great bravery, was choſen with a body of 500 men. The place was about 20 miles from Hudſon's River; and to ſupport Colonel Baum's party, the whole army marched up the river's bank, and encamped almoſt oppoſite to Saratoga, with the river betwixt it and that place. An advanced party was poſted at Batten Kill, between the camp and Bennington, in order to ſupport Colonel Baum. In their way the Britiſh ſeized a large ſupply of cattle and proviſions, which were immediately ſent to the camp; but the badneſs of the roads retarded their march ſo much, that intelligence of their deſign was ſent to Bennington. Underſtanding now that the Americans force was greatly ſuperior to his own, the Colonel acquainted the General, who immediately diſpatched Colonel Breyman with a party to his aſſiſtance; but through the ſame cauſes that had retarded the march of Colonel Baum, this aſſiſtance could not arrive in time. General Starke, in the mean time, who commanded at Bennington, determined to attack the two parties ſeparately; and for this purpoſe advanced againſt Colonel Baum, whom he

ſurrounded

281
Makes an attempt on the provincial magazines at Bennington.

ſurrounded on all ſides and attacked with the utmoſt violence.

282 Colonel Baum utterly defeated and taken priſoner.

The troops defended themſelves with great valour, but were to a man either killed or taken. Colonel Breyman, after a deſperate engagement, had the good luck to effect a retreat through the darkneſs of the night, which otherwiſe he could not have done, as his men had expended all their ammunition, being 40 rounds to each.

283 Colonel Breyman defeated.

General Burgoyne, thus diſappointed in his attempt on Bennington, applied himſelf with indefatigable diligence to procure proviſions from Fort George; and having at length amaſſed a ſufficient quantity to laſt for a month, he threw a bridge of boats over the river Hudſon, which he croſſed about the middle of September, encamping on the hills and plains near Saratoga. As ſoon as he approached the provincial army, at this time encamped at Stillwater under General Gates, he determined to make an attack; for which purpoſe he put himſelf at the head of the central diviſion of his army, having General Fraſer and Colonel Breyman on the right, with Generals Reidefel and Philips on the left. In this poſition he advanced towards the enemy on the 19th of September.

284 The Americans attack the Royal army,

But the Americans did not now wait to be attacked: on the contrary, they attacked the central diviſion with the utmoſt violence; and it was not until General Philips with the artillery came up, and at eleven o'clock at night, that they could be induced to retire to their camp.

285 And are with great difficulty repulſed.

On this occaſion, the Britiſh troops loſt about 500 in killed and wounded, and the enemy about 319. The former were very much alarmed at the obſtinate reſolution ſhown by the Americans, but this did not prevent them from advancing towards the enemy, and poſting themſelves the next day within cannon-ſhot of their lines.

286 The Indians deſert.

But their allies the Indians began to deſert in great numbers; and at the ſame time the general was in the higheſt degree mortified by having no intelligence of any aſſiſtance from Sir Henry Clinton, as had been ſtipulated.

287 A letter from Sir Henry Clinton, with General Burgoyne's anſwer.

He now received a letter from him, by which he was informed that Sir Henry intended to make a diverſion on the North River in his favour. This afforded but little comfort: however, he returned an anſwer by ſeveral truſty perſons whom he diſpatched different ways, ſtating his preſent diſtreſſed ſituation, and mentioning that the proviſions and other neceſſaries he had would only enable him to hold out till the 12th of October.

288 Expedition of the provincials againſt Ticonderago.

In the mean time the Americans, in order to cut off the retreat of the Britiſh army in the moſt effectual manner, undertook an expedition againſt Ticonderago; but were obliged to abandon the enterpriſe after having ſurpriſed all the out-poſts, and taken a great number of boats with ſome armed veſſels, and a number of priſoners. The army under general Burgoyne, however, continued to labour under the greateſt diſtreſſes; ſo that in the beginning of October he had been obliged to diminiſh the ſoldiers allowance. On the 7th of that month he determined to move towards the enemy. For this purpoſe he ſent a body of 1500 men to reconnoitre their left wing; intending, if poſſible, to break through it in order to effect a retreat.

289 They make a deſperate attack on the royal army.

The detachment, however, had not proceeded far when a dreadful attack was made upon the left wing of the Britiſh army, which was with great difficulty preſerved from being entirely broken by a reinforcement brought up by general Fraſer, who was killed in the attack.

290 Kill General Fraſer,

After the troops had with the moſt deſperate efforts regained their camp, it was moſt furiouſly aſſaulted by general Arnold; who, notwithſtanding all oppoſition, would have forced the entrenchments, had he not received a dangerous wound, which obliged him to retire.

291 And defeat the Germans with great ſlaughter.

Thus the attack failed on the left, but on the right the camp of the German reſerve was forced, Colonel Breyman killed, and his countrymen defeated with great ſlaughter, and the loſs of all their artillery and baggage.

This was by far the heavieſt loſs the Britiſh army had ſuſtained ſince the action at Bunker's Hill.

292 The royal army in danger of being ſurrounded.

The liſt of killed and wounded amounted to near 1200, excluſive of the Germans; but the greateſt misfortune was, that the enemy had now an opening on the right and rear of the Britiſh forces, ſo that the army was threatened with entire deſtruction. This obliged General Burgoyne once more to ſhift his poſition, that the enemy might alſo be obliged to alter theirs. This was accompliſhed on the night of the 7th, without any loſs, and all the next day he continued to offer the enemy battle; but they were now too well aſſured of obtaining a complete victory, by cutting off all ſupplies from the Britiſh, to riſk a pitched battle. Wherefore they advanced on the right ſide, in order to incloſe him entirely; which obliged the General to direct a retreat towards Saratoga.

293 Attempt a retreat without ſucceſs.

But the enemy had now ſtationed a great force on the ford at Hudſon's river, ſo that the only poſſibility of retreat was by ſecuring a paſſage to Lake George; and to effect this, a body of workmen were detached, with a ſtrong guard, to repair the roads and bridges that led to Fort Edward. As ſoon as they were gone, however, the enemy ſeemed to prepare for an attack; which rendered it neceſſary to recal the guard, and the workmen being of courſe left expoſed, could not proceed.

In the mean time, the boats which conveyed proviſions down Hudſon's river were expoſed to the continual fire of the American markſmen, who took many of them; ſo that it became neceſſary to convey the proviſions over land. In this extreme danger, it was reſolved to march by night to Fort Edward, forcing the paſſages at the fords either above or below the place; and, in order to effect this the more eaſily, it was reſolved that the ſoldiers ſhould carry their proviſions on their backs, leaving behind their baggage and every other incumbrance. But before this could be executed, intelligence was received that the enemy had raiſed ſtrong entrenchments oppoſite to theſe fords, well provided with cannon, and that they had likewiſe taken poſſeſſion of the riſing ground between Fort George and Fort Edward, which in like manner was provided with cannon.

294 Diſtreſſed ſituation of the royal army.

All this time the American army was increaſing by the continual arrival of militia and volunteers from all parts. Their parties extended all along the oppoſite bank of Hudſon's River, and ſome had even paſſed it in order to obſerve the leaſt movement of the Britiſh army. The whole force under General Gates was computed at 16,000 men, while the army under General Burgoyne ſcarce amounted to 6000; and every part of the camp was reached by the grape and rifle-ſhot of the enemy, beſides a diſcharge from their artillery, which was almoſt inceſſant. In this ſtate of extreme diſtreſs and danger, the army continued with the greateſt conſtancy

295
It is obliged to capitulate.

ſtancy and perſeverance till the evening of the 13th of October, when an inventory of proviſions being taken, it was found that no more remained than what were ſufficient to ſerve for three days; and a council of war being called, it was unanimouſly determined that there was no method now remaining but to treat with the enemy. In conſequence of this, a negociation was opened next day, which ſpeedily terminated in a capitulation of the whole Britiſh army; the principal article of which was, that the troops were to have a free paſſage to Britain, on condition of not ſerving againſt America during the war. On this occaſion, General Gates, with a generous magnanimity, ordered his army to keep within their camp while the Britiſh ſoldiers went to a place appointed for them to lay down their arms, that the latter might not have the additional mortification of being made ſpectacles on ſo melancholy an event. The number of thoſe who ſurrendered at Saratoga amounted to 5750, according to the American accounts; the liſt of ſick and wounded left in the camp when the army retreated to Saratoga, to 528; and the number of thoſe loſt by other accidents ſince the taking of Ticonderago, to near 3000. Thirty-five braſs field-pieces, 7000 ſtand of arms, clothing for an equal number of ſoldiers, with the tents, military-cheſt, &c. conſtituted the booty on this occaſion.

296
Succeſsful expedition of Sir Henry Clinton.

Sir Henry Clinton, in the mean time, had ſailed up the North River, and deſtroyed the two forts called Montgomery and Clinton, with Fort Conſtitution, and another place called Continental Village, where were barracks for 2000 men. Seventy large cannon were carried away, beſides a number of ſmaller artillery, and a great quantity of ſtores and ammunition; a large boom and chain reaching acroſs the river from Fort Montgomery to a point of land called St Anthony's Noſe, and which coſt not leſs than L. 70,000 Sterling, were partly deſtroyed and partly carried away, as was alſo another boom of little leſs value at Fort Conſtitution. The loſs of the Britiſh army was but ſmall in number, though ſome officers of great merit were killed in the different attacks.

Another attack was made by Sir James Wallace with ſome frigates, and a body of land forces under General Vaughan. The place which now ſuffered was named Eſopus: the fortifications were deſtroyed, and the town itſelf was wantonly reduced to aſhes, as that called Continental Village had been before.

297
Great dejection on account of Burgoyne's capture.

But theſe ſucceſſes, of whatever importance they might be, were now diſregarded by both parties. They ſerved only to irritate the Americans, fluſhed with their ſucceſs; and they were utterly inſufficient to raiſe the ſpirits of the Britiſh, who were now thrown into the utmoſt diſmay.

298
Treaty between France and America.

On the 16th of March 1778, Lord North intimated to the houſe of commons, that a paper had been laid before the king by the French ambaſſador, intimating the concluſion of an alliance between the court of France and the United States of America. The preliminaries of this treaty had been concluded in the end of the year 1777, and a copy of them ſent to congreſs, in order to counteract any propoſals that might be made in the mean time by the Britiſh miniſtry. On the 6th of February 1778, the articles were formally ſigned, to the great ſatisfaction of the French nation. They were in ſubſtance as follows:

1. If Great Britain ſhould, in conſequence of this treaty, proceed to hoſtilities againſt France, the two nations ſhould mutually aſſiſt one another.

2. The main end of the treaty was, in an effectual manner to maintain the independency of America.

3. Should thoſe places of North-America ſtill ſubject to Britain be reduced by the colonies, they ſhould be confederated with them, or ſubjected to their juriſdiction.

4. Should any of the Weſt India iſlands be reduced by France, they ſhould be deemed its property.

5. No formal treaty with Great Britain ſhould be concluded either by France or America without the conſent of each other; and it was mutually engaged that they ſhould not lay down their arms till the independency of the States had been formally acknowledged.

6. The contracting parties mutually agreed to invite thoſe powers that had received injuries from Great Britain to join the common cauſe.

7. The United States guaranteed to France all the poſſeſſions in the Weſt Indies which ſhe ſhould conquer; and France in her turn guaranteed the abſolute independency of the States, and their ſupreme authority over every country they poſſeſſed, or might acquire during the war.

299
Debates occaſioned by the treaty.

The notification of ſuch a treaty as this could not but be looked upon as a declaration of war. On its being announced to the houſe, every one agreed in an addreſs to his majeſty, promiſing to ſtand by him to the utmoſt in the preſent emergency; but it was warmly contended by the members in oppoſition, that the preſent miniſtry ought to be removed on account of their numberleſs blunders and miſcarriages in every inſtance. Many were of opinion, that the only way to extricate the nation from its trouble was to acknowledge the independency of America at once; and thus we might ſtill do with a good grace what muſt inevitably be done at laſt, after expending much more blood and treaſure than had yet been laviſhed in this unhappy conteſt. The miniſterial party, however, entertained different ideas. Inſtigated by zeal for the national honour, it was determined at once to reſent the arrogance of France, and proſecute hoſtilities againſt America with more vigour than ever, ſhould the terms now offered them be rejected.

300
Americans ſend agents to different courts.

The Americans in the mean time aſſiduouſly employed their agents at the courts of Spain, Vienna, Pruſſia, and Tuſcany, in order, if poſſible, to conclude alliances with them, or at leaſt to procure an acknowledgment of their independency. As it had been reported that Britain intended to apply for aſſiſtance to Ruſſia, the American commiſſioners were enjoined to uſe their utmoſt influence with the German princes to prevent ſuch auxiliaries from marching through their territories, and to endeavour to procure the recal of the German troops already ſent to America. To France they offered a ceſſion of ſuch Weſt India iſlands as ſhould be taken by the united ſtrength of France and America; and ſhould Britain by their joint endeavours be diſpoſſeſſed of Newfoundland, Cape Breton, and Nova Scotia, theſe territories ſhould be divided betwixt the two nations, and Great Britain be totally excluded from the fiſhery. The propoſals to the Spaniſh court were, that in caſe they ſhould think prop[illegible] pouſe their quarrel, the American ſtates ſhould aſſiſt in reducing Penſacola under the dominion of Spain, provided their ſubjects were allowed the free navigation of the river Miſſiſſippi and the uſe of the harbour of Penſacola; and they further offered, that, if agreeable to Spain, they would declare war againſt Portugal, ſhould that power expel the American ſhips from its ports.

301
General Burgoyne's troops detained in America.

In the mean time, the troops under General Burgoyne were preparing to embark for Britain according to the convention at Saratoga; but congreſs having received information, that many articles of ammunition and accoutrements had not been ſurrendered agreeably to the ſtipulated terms, and finding ſome cauſe to apprehend, that ſiniſter deſigns were harboured on the part of Great Britain to convey theſe troops to join the army at Philadelphia or New-York, poſitively refuſed to let them embark, until an explicit ratification of the convention ſhould be properly notified by the Britiſh court.

302
Conciliatory bill received with indignation by the army.

303
Deſpiſed by the coloniſts.

The ſeaſon for action was now approaching; and congreſs was indefatigable in its preparations for a new campaign, which it was confidently ſaid would be the laſt. Among other methods taken for this purpoſe, it was recommended to all the young gentlemen of the colonies to form themſelves into bodies of cavalry to ſerve at their own expence during the war. General Waſhington at the ſame time, to remove all incumbrances from his army, lightened the baggage as much as poſſible, by ſubſtituting ſacks and portmanteaus in place of cheſts and boxes, and uſing pack-horſes inſtead of waggons. On the other hand, the Britiſh army, expecting to be reinforced by 20,000 men, thought of nothing but concluding the war according to their wiſhes before the end of the campaign. It was with the utmoſt concern, as well as indignation, therefore, that they received the news of Lord North's conciliatory bill. It was univerſally looked upon as a national diſgrace; and ſome even tore the cockades from their hats, and trampled them under their feet as a token of their indignation. By the coloniſts it was received with indifference. The Britiſh commiſſioners endeavoured to make it as public as poſſible; and the congreſs, as formerly, ordered it to be printed in all the newſpapers. On this occaſion Governor Tryon incloſed ſeveral copies of the bill to General Waſhington in a letter, intreating that he would allow them to be circulated; to which the General returned for anſwer a copy of a newſpaper in which the bill was printed, with the reſolutions of congreſs upon it. Theſe were, That whoever preſumed to make a ſeparate agreement with Britain ſhould be deemed a public enemy; that the United States could not with any propriety keep correſpondence with the commiſſioners until their independence was acknowledged, and the Britiſh fleets and armies removed from America. At the ſame time, the colonies were warned not to ſuffer themſelves to be deceived into ſecurity by any offers that might be made; but to uſe their utmoſt endeavours to ſend their quotas with all diligence into the field. The individuals with whom the commiſſioners converſed on the ſubject of the conciliatory bill, generally returned for anſwer, that the day of reconciliation was paſt; and that the haughtineſs of Britain had extinguiſhed all filial regard in the breaſts of Americans.

304
Bad ſucceſs of the commiſſioners.

About this time alſo Mr Silas Deane arrived from France with two copies of the treaty of commerce and alliance to be ſigned by congreſs. Advices of the moſt agreeable nature were alſo received from various parts, repreſenting in the moſt favourable light the diſpoſitions of the European powers; all of whom, it was ſaid, wiſhed to ſee the independence of America ſettled upon the moſt permanent baſis. Conſidering the ſituation of matters with the coloniſts at this time, therefore, it was no wonder that the commiſſioners found themſelves unable to accompliſh the errand on which they came. Their propoſals were utterly rejected, themſelves treated as ſpies, and, after a vain attempt by governor Johnſtone, one of the commiſſioners, to bribe ſeveral members of congreſs, all intercourſe with them was interdicted.

305
Philadelphia evacuated.

But before any final anſwer could be obtained from congreſs, Sir Henry Clinton had taken the reſolution of evacuating Philadelphia. Accordingly, on the 10th of June, after having made all neceſſary preparations, the army marched out of the city and croſſed the Delaware before noon with all its baggage and other incumbrances. General Waſhington, appriſed of this deſign, had diſpatched expreſſes into the Jerſeys with orders to collect all the force that could be aſſembled in order to obſtruct the march of the enemy. After various movements on both ſides, Sir Henry Clinton, with the royal army, arrived on the 27th of June at a place called Freehold; where, judging that the enemy would attack him, he encamped in a very ſtrong ſituation. Here General Waſhington determined to make an attack as ſoon as the army had again begun its march. The night was ſpent in making the neceſſary preparations, and General Lee with his diviſion was ordered to be ready by day-break. But Sir Henry Clinton, juſtly apprehending that the chief object of the enemy was the baggage, committed it to the care of General Knyphauſen, whom he ordered to ſet out early in the morning, while he followed with the reſt of the army. The attack was accordingly made; but the Britiſh general had taken ſuch care to arrange his troops properly, and ſo effectually ſupported his forces when engaged with the Americans, that the latter not only made no impreſſion, but were with difficulty preſerved from a total defeat by the advance of General Waſhington with the whole army. The Britiſh troops effected their retreat in the night with the loſs of 300 men, of whom many died through mere fatigue, without any wound. In this action General Lee was charged by General Waſhington with diſobedience and miſconduct in retreating before the Britiſh army. He was tried by a court-martial, and ſentenced to a temporary ſuſpenſion from his command. After they had arrived at Sandy-Hook, a bridge of boats was by Lord Howe's directions thrown from thence over the channel which ſeparated the iſland from the main land, and the troops were conveyed aboard the fleet; after which they ſailed to New-York.

After ſending ſome light detachments to watch the enemy's motions, General Waſhington marched towards the North-River, where a great force had been collected to join him, and where it was now expected that ſome very capital operations would take place.

In the mean time France had ſet about her preparations for the aſſiſtance of the Americans. On the 14th of April Count d'Eſtaing had ſailed from Toulon with

306 French fleet arrives in America.

with a ſtrong ſquadron of ſhips of the line and frigates, and arrived on the coaſt of Virginia in the beginning of July, whilſt the Britiſh fleet was employed in conveying the forces from Sandy-Hook to New-York. It conſiſted of one ſhip of 20 guns, one of 80, ſix of 74, and four of 64, beſides ſeveral large frigates; and, excluſive of its complement of ſailors, had 6000 marines and ſoldiers on board. To oppoſe this the Britiſh had only ſix ſhips of 64 guns, three of 50, and two of 40, with ſome frigates and ſloops. Notwithſtanding this inferiority, however, the Britiſh admiral poſted himſelf ſo advantageouſly, and ſhowed ſuch ſuperior ſkill, that d'Eſtaing did not think proper to attack him; particularly, as the pilots informed him that it was impracticable to carry his large ſhips over the bar into the Hook, and General Waſhington preſſed him to ſail for Newport. He therefore remained at anchor four miles off Sandy-Hook till the 22d of July, without effecting any thing more than the capture of ſome veſſels, which, through ignorance of his arrival, fell into his hands.

307 Attempts Rhode-Iſland without ſucceſs.

The next attempt of the French admiral was, in conjunction with the Americans, on Rhode-Iſland. It was propoſed that d'Eſtaing, with the 6000 troops he had with him, ſhould make a deſcent on the ſouthern part of the iſland, while a body of the Americans ſhould take poſſeſſion of the north; at the ſame time the French ſquadron was to enter the harbour of Newport, and take and deſtroy all the Britiſh ſhipping. On the 8th of Auguſt the French admiral entered the harbour as was propoſed, but found himſelf unable to do any material damage. Lord Howe, however, inſtantly ſet ſail for Rhode-Iſland; and d'Eſtaing, confiding in his ſuperiority, immediately came out of the harbour to attack him. A violent ſtorm parted the two fleets, and did ſo much damage that they were rendered totally unfit for action. The French, however, ſuffered moſt; and ſeveral of their ſhips being afterwards attacked ſingly by the Britiſh, very narrowly eſcaped being taken. On the 20th of Auguſt he returned to Newport in a very ſhattered condition; and, not thinking himſelf ſafe there, ſailed two days after for Boſton. General Sullivan had landed in the mean time on the northern part of Rhode Iſland with 10,000 men. On the 17th of Auguſt they began their operations by erecting batteries, and making their approaches to the Britiſh lines. But General Pigot, who commanded in Newport, had taken ſuch effectual care to ſecure himſelf on the land-ſide, that without the aſſiſtance of a marine force it was altogether impoſſible to attack him with any probability of ſucceſs. The conduct of d'Eſtaing, therefore, who had abandoned them when maſter of the harbour, gave the greateſt diſguſt to the people of New-England, and Sullivan began to think of a retreat. On perceiving his intentions, the garriſon ſallied out upon him with ſo much vigour, that it was not without difficulty that he effected his retreat. He had not been long gone when Sir Henry Clinton arrived with a body of 4000 men; which, had it arrived ſooner, would have enabled the Britiſh commander to have gained a deciſive advantage over him, as well as to have deſtroyed the town of Providence, which, by its vicinity to Rhode-Iſland, and the enterpriſes which were continually projected and carried on in that place, kept the inhabitants of Rhode-Iſland in continual alarms.

308 The coaſts of America invaded by the Britiſh fleet.

The firſt Britiſh expedition was to Buzzard's-Bay, on the coaſt of New-England and neighbourhood of Rhode-Iſland. Here they deſtroyed a great number of privateers and merchantmen, magazines, with ſtorehouſes, &c.; whence proceeding to a fertile and populous iſland, called Martha's-Vineyard, they carried off 10,000 ſheep and 300 black cattle. Another expedition took place up the North-River, under Lord Cornwallis and General Knyphauſen; the principal event of which was, the deſtruction of a regiment of American cavalry known by the name of Waſhington's Light Horſe. A third expedition was directed to Little Egg-Harbour in New-Jerſey, a place noted for privateers, the deſtruction of which was its principal intention. It was conducted by Captains Ferguſon and Collins, and ended in the deſtruction of the enemy's veſſels, as well as of the place itſelf. At the ſame time part of another body of American troops, called Pulaſki's legion, was ſurpriſed, and a great number of them put to the ſword.

309 Expedition againſt Georgia.

The Americans had in the beginning of the year projected the conqueſt of Weſt-Florida; and one Captain Willing, with a party of reſolute men, had made a ſucceſsful incurſion into the country. This awakened the attention of the Britiſh to the ſouthern colonies, and an expedition againſt them was reſolved on. Georgia was the place of deſtination; and the more effectually to enſure ſucceſs, Colonel Campbell, with a ſufficient force, under convoy of ſome ſhips of war, commanded by Commodore Hyde Parker, embarked at New-York; while General Prevoſt, who commanded in Eaſt-Florida, was directed to ſet out with all the force he could ſpare. The armament from New-York arrived off the coaſt of Georgia in the month of December; and though the enemy were very ſtrongly poſted in an advantageous ſituation on the ſhore, the Britiſh troops made good their landing, and advanced towards Savannah the capital of the province. That very day they defeated the force of the provincials which oppoſed them; and took poſſeſſion of the town with ſuch celerity, that the Americans had not time to execute a reſolution they had taken of ſetting it on fire.

310 Take poſſeſſion of Georgia.

In ten days the whole province of Georgia was reduced, Sunbury alone excepted; and this was alſo brought under ſubjection by General Prevoſt in his march northward. Every proper method was taken to ſecure the tranquillity of the country; and rewards were offered for apprehending committee and aſſembly men, or ſuch as they judged moſt inimical to the Britiſh intereſts. On the arrival of general Prevoſt, the command of the troops naturally devolved on him as the ſenior officer; and the conqueſt of Carolina was next projected.

311 Carolina invaded.

In this attempt there was no ſmall probability of ſucceſs. The country contained a great number of friends to government, who now eagerly embraced the opportunity of declaring themſelves; many of the inhabitants of Georgia had joined the royal ſtandard; and there was not in the province any conſiderable body of provincial forces capable of oppoſing the efforts of regular and well-diſciplined troops. On the firſt news of General Prevoſt's approach, the loyaliſts aſſembled in a body, imagining themſelves able to ſtand their ground until their allies ſhould arrive; but in this they were diſappointed. The Americans attacked and defeated them with the loſs of half their number.

The remainder retreated into Georgia; and after undergoing many difficulties, at laſt effected a junction with the Britiſh forces.

312
Americans defeated.

In the mean time, General Lincoln, with a conſiderable body of American troops, had encamped within 20 miles of the town of Savannah; and another ſtrong party had poſted themſelves at a place called *Briar's Creek*, farther up the river of the ſame name. Thus the extent of the Britiſh government was likely to be circumſcribed within very narrow bounds. General Prevoſt therefore determined to diſlodge the party at Briar's Creek: and the latter, truſting to their ſtrong ſituation, and being remiſs in their guard, ſuffered themſelves to be ſurpriſed on the 30th of March 1779; when they were utterly routed with the loſs of more than 300 killed and taken, beſides a great number drowned in the river or the ſwamps. The whole artillery, ſtores, baggage, and almoſt all the arms of this unfortunate party were taken, ſo that they could no more make any ſtand; and thus the province of Georgia was once more freed from the enemy, and a communication opened with thoſe places in Carolina where the royaliſts chiefly reſided.

The victory at Briar's Creek proved of conſiderable ſervice to the Britiſh cauſe. Great numbers of the loyaliſts joined his army, and conſiderably increaſed its force. Hence he was enabled to ſtretch his poſts further up the river, and to guard all the principal paſſes: ſo that General Lincoln was reduced to a ſtate of inaction; and at laſt moved off towards Auguſta, in order to protect the provincial aſſembly, which was obliged to ſit in that place, the capital being now in the hands of the Britiſh.

313
The Britiſh troops advance to Charleſton.

Lincoln had no ſooner quitted his poſt, than it was judged a proper time by the Britiſh general to put in execution the grand ſcheme which had been meditated againſt Carolina. Many difficulties indeed lay in his way. The river Savannah was ſo ſwelled by the exceſſive rains of the ſeaſon, that it ſeemed impaſſable; the oppoſite ſhore, for a great way, was ſo full of ſwamps and marſhes, that no army could march over it without the greateſt difficulty; and, to render the paſſage ſtill more difficult, General Moultrie was left with a conſiderable body of troops in order to oppoſe the enemy's attempts. But in ſpite of every oppoſition, the conſtancy and perſeverance of the Britiſh forces at laſt prevailed. General Moultrie was obliged to retire towards Charleſton; and the purſuing army, after having waded through the marſhes for ſome time, at laſt arrived in an open country, through which they purſued their march with great rapidity towards the capital; while General Lincoln made preparations to march to its relief.

314
General Lincoln advances to its relief.

Certain intelligence of the danger to which Charleſton was expoſed, animated the American general. A choſen body of infantry, mounted on horſeback for the greater expedition, was diſpatched before him; while Lincoln himſelf followed with all the forces he could collect. General Moultrie too, with the troops he had brought from the Savannah, and ſome others he had collected ſince his retreat from thence, had taken poſſeſſion of all the avenues leading to Charleſton, and prepared for a vigorous defence. But all oppoſition proved ineffectual; and the Britiſh army was allowed to come within cannon ſhot of Charleſton on the 12th of May.

315
The attempt on it abandoned.

316
The Americans defeated.

The town was now ſummoned to ſurrender, and the inhabitants would gladly have agreed to obſerve a neutrality during the reſt of the war, and would have engaged alſo for the reſt of the province. But theſe terms not being accepted, they made preparations for a vigorous defence. It was not, however, in the power of the Britiſh commander at this time to make an attack with any proſpect of ſucceſs. His artillery was not of ſufficient weight; there were no ſhips to ſupport his attack by land; and general Lincoln advancing rapidly with a ſuperior army, threatened to incloſe him between his own force and the town; ſo that ſhould he fail in his firſt attempt, certain deſtruction would be the conſequence. For theſe reaſons he withdrew his forces from before the town, and took poſſeſſion of two iſlands, called *St James's* and *St John's*, lying to the ſouthward; where having waited ſome time, his force was augmented by the arrival of two frigates. With theſe he determined to make himſelf maſter of Port-Royal, another iſland poſſeſſed of an excellent harbour and many other natural advantages, from its ſituation alſo commanding all the ſea-coaſt from Charleſton to Savannah River. The American general, however, did not allow this to be accompliſhed without oppoſition. Perceiving that his opponent had occupied an advantageous poſt on St John's iſland preparatory to his enterpriſe againſt Port-Royal, he attempted, on the 20th of June, to diſlodge them from it; but, after an obſtinate attack, the provincials were obliged to retire with conſiderable loſs. On this occaſion the ſucceſs of the Britiſh arms was in a great meaſure owing to an armed float; which galled the right flank of the enemy ſo effectually, that they could direct their efforts only againſt the ſtrongeſt part of the lines, which proved impregnable to their attacks. This diſappointment was inſtantly followed by the loſs of Port-Royal, which General Prevoſt took poſſeſſion of, and put his troops into proper ſtations, waiting for the arrival of ſuch reinforcements as were neceſſary for the intended attack on Charleſton.

The profligate conduct of the refugees, and the officers and ſoldiers of the Britiſh, in plundering the houſes of individuals, during this incurſion, is incredible. Negroes were ſeduced or forced from their maſters; furniture and plate were ſeized without decency or authority; and the moſt infamous violations of every law of honour and honeſty were openly perpetrated. Individuals thus accumulated wealth, but the reputation of the Britiſh arms incurred an everlaſting ſtigma.

317
D'Eſtaing's proclamation.

In the mean time Count D'Eſtaing, who, as we have already obſerved, had put into Boſton harbour to refit, had uſed his utmoſt efforts to ingratiate himſelf with the inhabitants of that city. Zealous alſo in the cauſe of his maſter, he had publiſhed a proclamation to be diſperſed through Canada, inviting the people to return to their original friendſhip with France, and declaring that all who renounced their allegiance to Great Britain ſhould certainly find a protector in the king of France. All his endeavours, however, proved inſufficient at this time to produce any revolution, or even to form a party of any conſequence among the Canadians.

As ſoon as the French admiral had refitted his fleet, he took the opportunity, while that of Admiral Byron had been ſhattered by a ſtorm, of failing to the Weſt-Indies. During his operations there, the Americans having repreſented his conduct as totally unſerviceable to them, he received orders from Europe to aſſiſt the colonies with all poſſible ſpeed.

318
D'Eſtaing fails to the Weſt Indies

In compliance with theſe orders, he directed his courſe towards Georgia, with a deſign to recover that province out of the hands of the enemy, and to put it, as well as South-Carolina, in ſuch a poſture of defence as would effectually ſecure them from any future attack. This ſeemed to be an eaſy matter, from the little force with which he knew he ſhould be oppoſed; and the next object in contemplation was no leſs than the deſtruction of the Britiſh fleet and army at New-York, and their total expulſion from the continent of America. Full of theſe hopes, the French commander arrived off the coaſt of Georgia with a fleet of 22 ſail of the line and 10 large frigates. His arrival was ſo little expected, that ſeveral veſſels laden with proviſions and military ſtores fell into his hands; the Experiment alſo, a veſſel of 50 guns, commanded by Sir James Wallace, was taken after a ſtout reſiſtance. On the continent, the Britiſh troops were divided. General Prevoſt, with an inconſiderable part, remained at Savannah; but the main force was under Colonel Maitland at Port Royal. On the firſt appearance of the French fleet, an expreſs was diſpatched to Colonel Maitland: but it was intercepted by the enemy; ſo that before he could ſet out in order to join the commander in chief, the Americans had ſecured moſt of the paſſes by land, while the French fleet effectually blocked up the paſſage by ſea. But, by taking advantage of creeks and inlets, and marching over land, he arrived juſt in time to relieve Savannah.

319
D'Eſtaing's expedition againſt Georgia.

320
Conduct of the French commander.

D'Eſtaing had allowed General Prevoſt 24 hours to deliberate whether he ſhould capitulate or not. This time the general employed in making the beſt preparations he could for a defence; and during this time it was that Colonel Maitland arrived. D'Eſtaing's ſummons was now rejected; and as on this occaſion the ſuperiority of the enemy was by no means ſo much out of proportion as it had been at Grenada, there was every probability of ſucceſs on the part of the Britiſh. The garriſon now conſiſted of 3000 men, all of approved valour and experience, while the united force of the French and Americans did not amount to 10,000. The event was anſwerable to the expectations of the Britiſh general. Having the advantage of a ſtrong fortification and excellent engineers, the fire of the allies made ſo little impreſſion that D'Eſtaing reſolved to bombard the town, and a battery of nine mortars was erected for the purpoſe. This produced a requeſt from General Prevoſt, that the women and children might be allowed to retire to a place of ſafety. But the allied commanders, from motives of policy, refuſed compliance; and they reſolved to give a general aſſault. This was accordingly attempted on the 9th of October: but the aſſailants were every where repulſed with ſuch ſlaughter, that 1200 were killed and wounded; among the former were Count Pulaſki, the celebrated conſpirator againſt the reigning king of Poland, and among the latter was D'Eſtaing himſelf.

321
The French and American generals refuſe to permit the women to withdraw.

322
They are defeated.

This diſaſter entirely overthrew the ſanguine hopes of the Americans and French; but, ſo far from reproaches or animoſity ariſing between them, their common misfortune ſeemed to increaſe their confidence and eſteem for each other; a circumſtance fairly to be aſcribed to the conciliatory conduct of General Lincoln upon every occaſion. After waiting eight days longer, both parties prepared for a retreat; the French to their ſhipping, and the Americans into Carolina.

323
Succeſsful expeditions againſt the northern provinces

While the allies were thus unſucceſsfully employed in the ſouthern colonies, their antagoniſts were no leſs aſſiduous in diſtreſſing them in the northern parts. Sir George Collier was ſent with a fleet, carrying on board General Matthews, with a body of land forces, into the province of Virginia. Their firſt attempt was on the town of Portſmouth; where, though the enemy had deſtroyed ſome ſhips of great value, the Britiſh troops arrived in time to ſave a great number of others. On this occaſion about 120 veſſels of different ſizes were burnt, and 20 carried off; and an immenſe quantity of proviſions deſigned for the uſe of General Waſhington's army was either deſtroyed or carried off, together with a great variety of naval and military ſtores. The fleet and army returned with little or no loſs to New-York.

The ſucceſs with which this expedition was attended, ſoon gave encouragement to attempt another. The Americans had for ſome time been employed in the erection of two ſtrong forts on the river; the one at Verplanks Neck on the eaſt, and the other at Stoney Point on the weſt ſide. Theſe when completed would have been of the utmoſt ſervice to the Americans, as commanding the principal paſs, called the *King's Ferry*, between the northern and ſouthern colonies. At preſent, however, they were not in a condition to make any effectual defence; and it was therefore determined to attack them before the works ſhould be completed. The force employed on this occaſion was divided into two bodies; one of which directed its courſe againſt Verplanks, and the other againſt Stoney Point. The former was commanded by general Vaughan, the latter by General Patterſon, while the ſhipping was under the direction of Sir George Collier. General Vaughan met with no reſiſtance, the enemy abandoning their works, and ſetting fire to every thing combuſtible that they could not carry off. At Stoney Point, however, a vigorous defence was made, though the garriſon was at laſt obliged to capitulate upon honourable conditions. To ſecure the poſſeſſion of this laſt, which was the more important of the two, General Clinton removed from his former ſituation, and encamped in ſuch a manner that Waſhington could not give any aſſiſtance. The Americans, however, revenged themſelves by diſtreſſing, with their numerous privateers, the trade to New-York.

This occaſioned a third expedition to Connecticut, where theſe privateers were chiefly built and harboured. The command was given to Governor Tryon and to General Garth, an officer of known valour and experience. Under convoy of a conſiderable number of armed veſſels they landed at Newhaven, where they demoliſhed the batteries that had been erected to oppoſe them, and deſtroyed the ſhipping and naval ſtores; but they ſpared the town itſelf, as the inhabitants had abſtained from firing out of their houſes upon the troops. From Newhaven they marched to Fairfield, where they proceeded as before, reducing the town alſo to aſhes.

Norwalk was next attacked, which in like manner was reduced to aſhes; as was alſo Greenfield, a ſmall ſea-port in the neighbourhood. Such repeated conflagrations, wantonly and cruelly ſpread, ſerved only to increaſe the diſguſt which was felt by every friend to the American cauſe.

Theſe ſucceſſes proved very alarming as well as detrimental to the Americans; ſo that General Waſhington determined at all events to drive the enemy from Stoney Point. For this purpoſe he ſent Gen. Wayne with a detachment of choſen men, directing him to attempt the recovery of it by ſurpriſe. On this occaſion the Americans ſhowed a ſpirit and reſolution exceeding any thing either party had performed during the courſe of the war. Though after the capture of it by the Britiſh the fortifications of this place had been completed, and were very ſtrong, they attacked the enemy with bayonets, after paſſing through a heavy fire of muſquetry and grape ſhot; and, in ſpite of all oppoſition, obliged the ſurviving part of the garriſon, amounting to 500 men, to ſurrender themſelves priſoners of war.

Though the Americans did not at preſent attempt to retain poſſeſſion of Stoney Point, the ſucceſs they had met with in the enterpriſe emboldened them to make a ſimilar attempt on Paulus Hook, a fortified poſt on the Jerſey ſide, oppoſite to New-York; but, although the heroiſm of the enterpriſe and the ſpirit with which it was executed deſerves applauſe, after having completely ſurpriſed the poſts, the American commander, Major Lee, finding it impoſſible to retain them, made an orderly retreat, with about 161 priſoners, among whom were ſeven officers.

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Unſucceſsful expedition of the Americans againſt Penobſcot.

Another expedition of greater importance was now projected on the part of the Americans. This was againſt a poſt on the river Penobſcot, on the borders of Nova Scotia, of which the Britiſh had lately taken poſſeſſion, and where they had begun to erect a fort which threatened to be a very great inconvenience to the coloniſts. The armament deſtined againſt it was ſo ſoon got in readineſs, that Colonel Maclane, the commanding officer at Penobſcot, found himſelf obliged to drop the execution of part of his ſcheme; and inſtead of a regular fort, to content himſelf with putting the works already conſtructed in as good a poſture of defence as poſſible. The Americans could not effect a landing without a great deal of difficulty, and bringing the guns of their largeſt veſſels to bear upon the ſhore. As ſoon as this was done, however, they erected ſeveral batteries, and kept up a briſk fire for the ſpace of a fortnight; after which they propoſed to give a general aſſault: but before this could be effected, they perceived Sir George Collier with a Britiſh fleet ſailing up the river to attack them. On this they inſtantly embarked their artillery and military ſtores, ſailing up the river as far as poſſible in order to avoid him. They were ſo cloſely purſued, however, that not a ſingle veſſel could eſcape; ſo that the whole fleet, conſiſting of 19 armed veſſels and 24 tranſports, was deſtroyed; moſt of them indeed being blown up by themſelves. The ſoldiers and ſailors were obliged to wander through immenſe deſarts, where they ſuffered much for want of proviſions; and to add to their calamities, a quarrel broke out between the ſoldiers and ſeamen concerning the cauſe of their diſaſter, which ended in a violent fray, wherein a great number were killed.

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Spain joins the confederacy againſt Britain.

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Fort Omoa taken by the Britiſh.

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But they are obliged to evacuate it.

Thus the arms of America and France being almoſt every where unſucceſsful, the independency of the former ſeemed yet to be in danger, notwithſtanding the aſſiſtance of ſo powerful an ally, when further encouragement was given by the acceſſion of Spain to the confederacy againſt Britain in the month of June 1779. The firſt effect of this appeared in an invaſion of Weſt Florida by the Spaniards in September 1779. As the country was in no ſtate of defence, the enemy eaſily made themſelves maſters of the whole, almoſt without oppoſition. Their next enterpriſe, was againſt the Bay of Honduras, where the Britiſh logwood-cutters were ſettled. Theſe finding themſelves too weak to reſiſt, applied to the governor of Jamaica for relief; who ſent them a ſupply of men, ammunition, and military ſtores, under Captain Dalrymple. Before the arrival of this detachment, the principal ſettlement in thoſe parts, called *St George's Key*, had been taken by the Spaniards and retaken by the Britiſh. In his way Captain Dalrymple fell in with a ſquadron from Admiral Parker in ſearch of ſome regiſter ſhips richly laden; but which, retreating into the harbour of Omoa, were too ſtrongly protected by the fort to be attacked with ſafety. A project was then formed, in conjunction with the people of Honduras, to reduce this fort. The deſign was to ſurpriſe it; but the Spaniards having diſcovered them, they were obliged to fight. Victory quickly declared for the Britiſh; but the fortifications were ſo ſtrong, that the artillery they had brought along with them were found too light to make any impreſſion. It was then determined to try the ſucceſs of an eſcalade; and this was executed with ſo much ſpirit, that the Spaniards ſtood aſtoniſhed without making any reſiſtance, and, in ſpite of all the efforts of the officers, threw down their arms and ſurrendered. The ſpoil was immenſe, being valued at three millions of dollars. The Spaniards chiefly lamented the loſs of 250 quintals of quickſilver; a commodity indiſpenſably neceſſary in the working of their gold and ſilver mines, ſo that they offered to ranſom it at any price; but this was refuſed, as well as the ranſom of the fort, though the governor offered 300,000 dollars for it. A ſmall garriſon was left for the defence of the place: but it was quickly attacked by a ſuperior force, and obliged to evacuate it, though not without deſtroying every thing that could be of uſe to the enemy; ſpiking the guns, and even locking the gates of the fort and carrying off the keys. All this was done in ſight of the beſiegers; after which the garriſon embarked without the loſs of a man.

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Americans take vengeance on the Indians.

As no operations of any conſequence took place this year in the province of New-York, the congreſs made uſe of the opportunity to diſpatch General Sullivan with a conſiderable force, in order to take vengeance on the Indians for their ravages and depredations. Of this the Indians were appriſed; and collecting all their ſtrength, reſolved to come to a deciſive engagement. Accordingly they took a ſtrong poſt in the moſt woody and mountainous part of the country; erecting a breaſt-work in their front, of large logs of wood extending half a mile in length, while their right flank was covered by a river, and the left by a hill of difficult acceſs. This advantageous poſition they had taken by the advice of the refugees who were among them, and of whom 200 or 300 were preſent in the battle.

Thus poſted, the Indians waited the reproach of the American army: but the latter having brought ſome artillery along with them, played it againſt the breaſt-work of the enemy with ſuch ſucceſs, that in two hours it was almoſt deſtroyed; and at the ſame time a party having reached the top of the hill, they became apprehenſive of being ſurrounded, on which they inſtantly fled with precipitation, leaving a great number of killed and wounded behind them. The Americans after this battle met with no further reſiſtance of any conſequence. They were ſuffered to proceed without interruption. On entering the country of the Indians, it appeared that they had been acquainted with agriculture and the arts of peace far beyond what had been ſuppoſed. From General Sullivan's pompous account (which, however, became a ſubject of ridicule among the ſoldiers in General Waſhington's army), it was learned, that the Indian houſes were large, convenient, and even elegant; their grounds were excellently cultivated, and their gardens abounded in fruit-trees and vegetables of all kinds fit for food. The whole of this fine country would now by the American general have been converted into a deſart, had it not been for the humane forbearance of General Hand and Colonel Durbin, in executing the orders of General Sullivan. The deſolation, however, was extenſive, and not to be juſtified by the ſavage character and example of their enemy.

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y Clinton
gainſt
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We muſt now take a view of the tranſactions in the ſouthern colonies; to which the war was, in the year 1780, ſo effectually transferred, that the operations there became at laſt deciſive. The ſucceſs of General Prevoſt in advancing to the very capital of South-Carolina has been already related, together with the obſtacles which prevented him from becoming maſter of it at that time. Towards the end of the year 1779, however, Sir Henry Clinton ſet ſail from New-York with a conſiderable body of troops, intended for the attack of Charleſton, South-Carolina, in a fleet of ſhips of war and tranſports under the command of Vice-admiral Arbuthnot. They had a very tedious voyage; the weather was uncommonly bad; ſeveral of the tranſports were loſt, as were alſo the greater part of the horſes which they carried with them, intended for cavalry or other public uſes; and an ordnance-ſhip likewiſe foundered at ſea. Having arrived at Savannah, where they endeavoured to repair the damages ſuſtained on their voyage, they proceeded from thence on the 10th of February, 1780, to North Ediſto, the place of debarkation which had been previouſly appointed. They had a favourable and ſpeedy paſſage thither: and though it required time to have the bar explored and the channel marked, the tranſports all entered the harbour the next day; and the army took poſſeſſion of St John's iſland, about 30 miles from Charleſton, without oppoſition. Preparations were then made for paſſing the ſquadron over Charleſton bar, where the high-water ſpring-tides were only 19 feet deep: but no opportunity offered of going into the harbour till the 20th of March, when it was effected without any accident, though the American gallys continually attempted to prevent the Engliſh boats from ſounding the channel. The Britiſh troops had previouſly removed from John's to James's iſland; and on the 29th of the ſame month they effected their landing on Charleſton neck. On the 1ſt of April they broke ground within 800 yards of the American works; and by the 8th the beſiegers guns were mounted in battery.

As ſoon as the army began to erect their batteries againſt the town, Admiral Arbuthnot embraced the firſt favourable opportunity of paſſing Sullivan's iſland, upon which there was a ſtrong fort of batteries, the chief defence of the harbour. He weighed on the 9th, with the Roebuck, Richmond, and Romulus, Blonde, Virginia, Raleigh, and Sandwich armed ſhip, the Renown bringing up the rear; and, paſſing through a ſevere fire, anchored in about two hours under James's iſland, with the loſs of 27 ſeamen killed and wounded. The Richmond's fore-top-maſt was ſhot away, and the ſhips in general ſuſtained damage in their maſts and rigging, though not materially in their hulls. But the Acetus tranſport, having on board ſome naval ſtores, grounded within gun-ſhot of Sullivan's iſland, and received ſo much damage that ſhe was obliged to be abandoned and burnt.

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The town defended by Lincoln.

On the 10th, Sir Henry Clinton and Admiral Arbuthnot ſummoned the town to ſurrender to his majeſty's arms: but Major-general Lincoln, who commanded in Charleſton, returned them an anſwer, declaring it to be his intention to defend the place. The batteries were now opened againſt the town; and from their effect the fire of the American advanced works conſiderably abated. It appears that the number of troops under the command of Lincoln were by far too few for defending works of ſuch extent as thoſe of Charleſton; and that many of theſe were men little accuſtomed to military ſervice, and very ill provided with clothes and other neceſſaries. Lincoln had been for ſome time expecting reinforcements and ſupplies from Virginia and other places: but they came in very ſlowly. Earl Cornwallis, and Lieutenant-colonel Tarleton under him, were alſo extremely active in intercepting ſuch reinforcements and ſupplies as were ſent to the American general. They totally defeated a conſiderable body of cavalry and militia which was proceeding to the relief of the town; and alſo made themſelves maſters of ſome poſts which gave them in a great degree the command of the country, by which means great ſupplies of proviſions fell into their hands. Tarleton was himſelf, however, defeated in a rencounter, with Lieutenant Colonel Waſhington, at the head of a regular corps of horſe.

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Several reinforcements intended for his relief intercepted

Such was the ſtate of things, and Fort Sullivan had alſo been taken by the king's troops, when on the 18th of May General Clinton again ſummoned the town to ſurrender; an offer being made, as had been done before, that if they ſurrendered, the lives and property of the inhabitants ſhould be preſerved to them. Articles of capitulation were then propoſed by General Lincoln; but the terms were not agreed to by General Clinton. At length, however, the town being cloſely inveſted on all ſides, and the preparations to ſtorm it in every part being in great forwardneſs, and the ſhips ready to move to the aſſault, General Lincoln, who had been applied to for that purpoſe by the inhabitants,

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The place ſurrenders.

inhabitants, ſurrendered it on ſuch articles of capitulation as General Clinton had before agreed to. This was on the 4th of May, which was one month and two days after the town had been firſt ſummoned to ſurrender.

A large quantity of ordnance, arms, and ammunition, was found in Charleſton; and, according to Sir Henry Clinton's account, the number of priſoners taken in Charleſton amounted to 5618 men, excluſively of near a thouſand ſailors in arms; but according to General Lincoln's account tranſmitted to the congreſs, the whole number of continental troops taken priſoners amounted to no more than 2487. The remainder, therefore, included in General Clinton's account, muſt have conſiſted of militia and inhabitants of the town. Several American frigates were alſo taken or deſtroyed in the harbour of Charleſton.

The loſs of Charleſton evidently excited a conſiderable alarm in America: and their popular writers, particularly the author of the celebrated performance entitled Common Senſe, in ſome other pieces made uſe of it as a powerful argument to lead them to more vigorous exertions againſt Great Britain, that they might the more effectually and certainly ſecure their independence.

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Apprehenſions at New York

While Sir Henry Clinton was employed in his voyage to Charleſton, and in the ſiege of that place, the garriſon at New-York ſeem not to have been wholly free from apprehenſions for their own ſafety. An intenſe froſt, accompanied with great falls of ſnow, began about the middle of December 1779, and ſhut up the navigation of the port of New-York from the ſea, within a few days after the departure of Admiral Arbuthnot and General Clinton. The ſeverity of the weather increaſed to ſo great a degree, that towards the middle of January all communications with New-York by water were entirely cut off, and as many new ones opened by the ice. The inhabitants could ſcarcely be ſaid to be in an inſular ſtate. Horſes with heavy carriages could go over the ice into the Jerſeys from one iſland to another. The paſſage on the North River, even in the wideſt part from New-York to Paulus Hook, which was 2000 yards, was about the 19th of January practicable for the heavieſt cannon: an event which had been unknown in the memory of man. Proviſions were ſoon after tranſported upon ſledges, and a detachment of cavalry marched upon the ice from New-York to Staten-Iſland, which was a diſtance of 11 miles.

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Forwardneſs of the inhabitants to be inrolled for its defence.

The city of New-York being thus circumſtanced, was conſidered as much expoſed to the attacks from the continental troops: and it was ſtrongly reported that General Waſhington was meditating a great ſtroke upon New-York with his whole force, by different attacks. Some time before this, Major-general Pattiſon, commandant at New-York, having received an addreſs from many of the inhabitants, offering to put themſelves in military array, he thought the preſent a favourable opportunity of trying the ſincerity of their profeſſions. Accordingly he iſſued a proclamation, calling upon all the male inhabitants from 16 to 60 to take up arms. The requiſition was ſo readily complied with, that in a few days 40 companies from the ſix wards of the city were inrolled, officered, and under arms, to the number of 2600, many ſubſtantial citizens ſerving in the ranks of each company. Other volunteer companies were formed; and the city was put into a very ſtrong poſture of defence.

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The provincials attack Staten Iſland;

No attack, however, was made upon New-York, whatever deſign might originally have been meditated; but an attempt was made upon Staten-Iſland, where there were about 1800 men, under the command of Brigadier-general Sterling, who were well intrenched. General Waſhington, whoſe army was hutted at Morris-Town, ſent a detachment of 2700 men, with ſix pieces of cannon, two mortars, and ſome horſes, commanded by Lord Sterling, who arrived at Staten-Iſland early in the morning of the 15th of January. The advanced poſts of the Britiſh troops retired upon the approach of the Americans, who formed the line, and made ſome movements in the courſe of the day; but they withdrew in the night, after having burnt one houſe, pillaged ſome others, and carried off with them about 200 head of cattle. Immediately on the arrival of the Americans on Staten-Iſland, Lieutenant-general Knyphauſen had embarked 600 men to attempt a paſſage, and to ſupport General Sterling: but the floating ice compelled them to return. It is, however, imagined, that the appearance of theſe tranſports, with the Britiſh troops on board, which the Americans could ſee towards the cloſe of the day, induced the latter to make ſo precipitate a retreat.

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But are induced to make a precipitate retreat.

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Proclamations by General Clinton.

After Charleſton had ſurrendered to the king's troops, General Clinton iſſued two proclamations, and alſo circulated a hand-bill amongſt the inhabitants of South-Carolina, in order to induce them to return to their allegiance, and to be ready to join the king's troops. It was ſaid, that the helping hand of every man was wanted to re-eſtabliſh peace and good government: and that as the commander in chief wiſhed not to draw the king's friends into danger, while any doubt could remain of their ſucceſs; ſo, now, that this was certain, he truſted that one and all would heartily join, and by a general concurrence give effect to ſuch neceſſary meaſures for that purpoſe as from time to time might be pointed out. Thoſe who had families were to form a militia to remain at home, and occaſionally to aſſemble in their own diſtricts, when required, under officers of their own chooſing, for the maintenance of peace and good order. Thoſe who had no families, and who could conveniently be ſpared for a time, it was preſumed, would cheerfully aſſiſt his majeſty's troops in driving their oppreſſors, acting under the authority of congreſs, and all the miſeries of war, far from that colony. For this purpoſe it was ſaid to be neceſſary that the young men ſhould be ready to aſſemble when required, and to ſerve with the king's troops for any ſix months of the enſuing twelve that might be found requiſite, under proper regulations. They might chooſe officers to each company to command them; and were to be allowed, when on ſervice, pay, ammunition, and proviſions, in the ſame manner as the king's troops. When they joined the army, each man was to be furniſhed with a certificate, declaring that he was only engaged to ſerve as a militia-man for the time ſpecified; that he was not to be marched beyond North-Carolina and Georgia; and that, when the time was out, he was freed from all claims whatever of military ſervice, excepting the common and uſual militia-duty where he lived. He would then, it was ſaid, have paid his debt to his country, and be intitled to enjoy undiſturbed that peace, liberty, and property, at home, which he had contributed to ſecure. The proclamations and publications of General Clinton appear to have produced ſome effect in South Carolina; though they probably operated chiefly upon thoſe who were before not much inclined to the cauſe of American independence. Two hundred and ten of the inhabitants of Charleſton ſigned an addreſs to General Clinton and Admiral Arbuthnot, ſoliciting to be readmitted to the character and condition of Britiſh ſubjects, the inhabitants of that city having been hitherto conſidered as priſoners on parole; declaring their diſapprobation of the doctrine of American independence; and expreſſing their regret, that after the repeal of thoſe ſtatutes which gave riſe to the troubles in America, the overtures made by his majeſty's commiſſioners had not been regarded by the congreſs. Sir Henry Clinton, in one of the proclamations iſſued at this time, declared, that if any perſons ſhould thenceforward appear in arms in order to prevent the eſtabliſhment of his majeſty's government in that country, or ſhould, under any pretence or authority whatſoever, attempt to compel any other perſon or perſons to do ſo, or who ſhould hinder or intimidate the king's faithful and loyal ſubjects from joining his forces or otherwiſe performing thoſe duties their allegiance required, ſuch perſons ſhould be treated with the utmoſt ſeverity, and their eſtates be immediately ſeized in order to be confiſcated.

Mean time the ravages of war did not prevent the Americans from paying ſome attention to the arts of peace. On the 4th of May an act paſſed by the council and houſe of repreſentatives of Maſſachuſetts-Bay for incorporating and eſtabliſhing a ſociety for the cultivation and promotion of the arts and ſciences. See Academy, p. 43. col. 2.

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Proceedings of congreſs.

Some doubts having ariſen in the congreſs, towards the cloſe of the preceding year, about the propriety of their aſſembling in the city of Philadelphia, it was now reſolved that they ſhould continue to meet there: and a committee of three members was appointed, to report a proper place where buildings might be provided for the reception of the congreſs, together with an eſtimate of the expence of providing ſuch buildings, and the neceſſary offices for the ſeveral boards. It was alſo reſolved by the congreſs, that a monument ſhould be erected to the memory of their late general Richard Montgomery, who fell at Quebec, in teſtimony of his ſignal and important ſervices to the United States of America, with an inſcription expreſſive of his amiable character and heroic atchievements; and that the continental treaſurers ſhould be directed to advance a ſum not exceeding L. 300 to Dr Franklin to defray the expence; that gentleman being deſired to cauſe the monument to be executed at Paris, or in ſome other part of France. It was likewiſe reſolved by the congreſs, that a court ſhould be eſtabliſhed for the trial of all appeals from the court of admiralty of the United States of America, in caſes of capture; to conſiſt of three judges, appointed and commiſſioned by congreſs, and who were to take an oath of office; and that the trials in this court ſhould be determined by the uſage of nations.

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Difficulties ariſing from the depreciation of the paper-currency.

The difficulties of the congreſs and of the people of America had been greatly increaſed by the depreciation of their paper currency. At the time when the colonies engaged in a war with Great Britain, they had no regular civil governments eſtabliſhed among them of ſufficient energy to enforce the collection of taxes, or to provide funds for the redemption of ſuch bills of credit as their neceſſities obliged them to iſſue. In conſequence of this ſtate of things, their bills increaſed in quantity far beyond the ſum neceſſary for the purpoſe of a circulating medium: and as they wanted at the ſame time ſpecific funds to reſt on for their redemption, they ſaw their paper-currency daily ſink in value. The depreciation continued, by a kind of gradual progreſſion, from the year 1777 to 1780: ſo that, at the latter period, the continental dollars were paſſed, by common conſent, in moſt parts of America, at the rate of at leaſt $\frac{39}{40}$ths below their nominal value. The impoſſibility of keeping up the credit of the currency to any fixed ſtandard, occaſioned great and almoſt inſurmountable embarraſſments in aſcertaining the value of property, or carrying on trade with any ſufficient certainty. Thoſe who ſold, and thoſe who bought, were left without a rule whereon to form a judgment of their profit or their loſs; and every ſpecies of commerce or exchange, whether foreign or domeſtic, was expoſed to numberleſs and increaſing difficulties. The conſequences of the depreciation of the paper-currency were alſo felt with peculiar ſeverity by ſuch of the Americans as were engaged in their military ſervices, and greatly augmented their other hardſhips. The requiſitions made by the congreſs to the ſeveral colonies for ſupplies, were alſo far from being always regularly complied with: and their troops were not unfrequently in want of the moſt common neceſſaries; which naturally occaſioned complaints and diſcontent among them. Some of theſe difficulties, reſulting from their circumſtances and ſituation, perhaps no wiſdom could have prevented: but they ſeem to have ariſen in part from the congreſs not being ſufficiently acquainted with the principles of finance, and from a defect of ſyſtem in the departments of their government. The cauſe of the Americans appears alſo to have ſuffered ſomewhat by their depending too much on temporary enliſtments. But the congreſs endeavoured, towards the cloſe of the year 1780, to put their army upon a more permanent footing, and to give all the ſatisfaction to their officers and ſoldiers which their circumſtances would permit. They appointed a committee for arranging their finances, and made ſome new regulations reſpecting the war-office and treaſury-board, and other public departments.

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Anniverſary of American independence celebrated at Philadelphia.

Notwithſtanding the diſadvantages under which they laboured, the Americans ſeemed to entertain no doubts but that they ſhould be able to maintain their independency. The 4th of July was celebrated this year at Philadelphia with ſome pomp, as the anniverſary of American independence. A commencement for conferring degrees in the arts was held the ſame day, in the hall of the univerſity there; at which the preſident and members of the congreſs attended, and other perſons in public offices. The Chevalier de la Luzerne, miniſter plenipotentiary from the French king to the United States, was alſo preſent on the occaſion. A charge was publicly addreſſed by the provoſt of the univerſity to the ſtudents; in which he ſaid, that he could not but congratulate them “ on that auſpicious day, which, amidſt the confuſions and deſolations of war, beheld learning beginning to revive; and animated them with the pleaſing proſpect of ſeeing the ſacred lamp of ſcience burning with a ſtill brighter flame, and ſcattering its invigorating rays over the unexplored deſarts of this extenſive continent; until the whole world ſhould be involved in the united blaze of knowledge, liberty, and religion. When he ſtretched his views forward (he ſaid), and ſurveyed the riſing glories of America, the enriching conſequences of their determined ſtruggle for liberty, the extenſive fields of intellectual improvement and uſeful invention, in ſcience and arts, in agriculture and commerce, in religion and government, through which the unfettered mind would range, with increaſing delight, in queſt of the undiſcovered treaſure which yet lay concealed in the animal, vegetable, and mineral kingdoms of the new world; or in the other fertile ſources of knowledge with which it abounded,—his heart ſwelled with the pleaſing proſpect, that the ſons of that inſtitution would diſtinguiſh themſelves, in the different walks of life, by their literary contributions to the embelliſhments and increaſe of human happineſs.”

341 A large body of French troops land at Rhode Iſland.

On the 10th of July, M. Ternay, with a fleet conſiſting of ſeven ſhips of the line, beſides frigates, and a large body of French troops, commanded by the Count de Rochambeau, arrived at Rhode-Iſland; and the following day 6000 men were landed there. A committee from the general aſſembly of Rhode-Iſland was appointed to congratulate the French general upon his arrival: whereupon he returned an anſwer, in which he informed them, that the king his maſter had ſent him to the aſſiſtance of his good and faithful allies the United States of America. At preſent, he ſaid, he only brought over the vanguard of a much greater force deſtined for their aid; and the king had ordered him to aſſure them, that his whole power ſhould be exerted for their ſupport. He added, that the French troops were under the ſtricteſt diſcipline; and, acting under the orders of General Waſhington, would live with the Americans as their brethren.

A ſcheme was ſoon after formed, of making a combined attack with Engliſh ſhips and troops, under the command of Sir Henry Clinton and Admiral Arbuthnot, againſt the French fleet and troops at Rhode-Iſland. Accordingly a conſiderable part of the troops at New-York were embarked for that purpoſe. General Waſhington having received information of this, paſſed the North River, by a very rapid movement, and, with an army increaſed to 12,000 men, proceeded with celerity towards King's Bridge, in order to attack New-York; but learning that the Britiſh general had changed his intentions, and diſembarked his troops on the 31ſt of the month, General Waſhington recroſſed the river and returned to his former ſtation. Sir Henry Clinton and the Admiral had agreed to relinquiſh their deſign of attacking the French and Americans at Rhode-Iſland as impracticable for the preſent.

342 Unſucceſsful expedition in the Jerſeys.

An unſucceſsful attempt was alſo made about this time in the Jerſeys by General Knyphauſen, with 7000 Britiſh troops under his command, to ſurpriſe the advanced poſts of General Waſhington's army. They proceeded very rapidly towards Springfield, meeting little oppoſition till they came to the bridge there, which was very gallantly defended by 170 of the continental troops, for 15 minutes, againſt the Britiſh army: but they were at length obliged to give up ſo unequal a conteſt, with the loſs of 37 men. After ſecuring this paſs, the Britiſh troops marched into the place, and ſet fire to moſt of the houſes. They alſo committed ſome other depredations in the Jerſeys; but gained no laurels there, being obliged to return about the beginning of July without effecting any thing material.

343 Victory obtained by Lord Cornwallis over Gen. Gates.

But in South-Carolina the royal arms were attended with more ſucceſs. Earl Cornwallis, who commanded the Britiſh troops there, obtained a ſignal victory over General Gates on the 16th of Auguſt. The action began at break of day, in a ſituation very advantageous for the Britiſh troops, but very unfavourable to the Americans. The latter were much more numerous; but the ground on which both armies ſtood was narrowed by ſwamps on the right and left, ſo that the Americans could not properly avail themſelves of their ſuperior numbers. There ſeems to have been ſome want of generalſhip in Gates, in ſuffering himſelf to be ſurpriſed in ſo diſadvantageous a poſition: but this circumſtance was the effect of accident; for both armies ſet out with a deſign of attaking each other preciſely at the ſame time, at ten the preceding evening, and met together before day-light at the place where the action happened. The attack was made by the Britiſh troops with great vigour, and in a few minutes the action was general along the whole line. It was at this time a dead calm, with a little hazineſs in the air, which preventing the ſmoke from riſing, occaſioned ſo thick a darkneſs, that it was difficult to ſee the effect of a very heavy and well-ſupported fire on both ſides. The Britiſh troops either kept up a conſtant fire, or made uſe of bayonets, as opportunities offered; and after an obſtinate reſiſtance during three quarters of an hour, threw the Americans into total confuſion, and forced them to give way in all quarters. The continental troops behaved remarkably well, but the militia were ſoon broken, and left the former to oppoſe the whole force of the Britiſh troops. General Gates did all in his power to rally the militia, but without effect: the continentals retreated in ſome order; but the rout of the militia was ſo great, that the Britiſh cavalry are ſaid to have continued the purſuit of them to the diſtance of 22 miles from the place where the action happened. The loſs of the Americans was very conſiderable: about 1000 priſoners were taken, and more are ſaid to have been killed and wounded, but the number is not very accurately aſcertained. Seven pieces of braſs cannon, a number of colours, and all the ammunition-waggons of the Americans, were alſo taken. Of the Britiſh troops, the killed and wounded amounted to 213. Among the priſoners taken was Major-general Baron de Kalb, a Pruſſian officer in the American ſervice, who was mortally wounded, having exhibited great gallantry in the courſe of the action, and received 11 wounds. The Britiſh troops by which this victory was atchieved, did not much exceed 2000, while the American army is ſaid to have amounted to 6000; of which, however, the greateſt part was militia.

Lieutenant-colonel Tarleton, who had greatly diſtinguiſhed himſelf in this action, was detached the following

344 Activity of Lieut. Col. Tarleton.

following day, with ſome cavalry and light infantry, amounting to about 350 men, to attack a corps of Americans under General Sumpter. He executed this ſervice with great activity and military addreſs. He procured good information of Sumpter's movements; and by forced and concealed marches came up with and ſurpriſed him in the middle of the day on the 18th, near the Catawba fords. He totally deſtroyed or diſperſed his detachment, which conſiſted of 700 men, killing 150 on the ſpot, and taking two pieces of braſs cannon, 300 priſoners, and 44 waggons.

345 General Arnold deſerts the ſervice of congreſs.

Not long after theſe events, means were found to detach Major-general Arnold, who had engaged ſo ardently in the cauſe of America, and who had exhibited ſo much bravery in the ſupport of it, from the intereſts of the congreſs. Major André, adjutant-general to the Britiſh army, was a principal agent in this tranſaction: or, if the overture of joining the king's troops came firſt from Arnold, this gentleman was the perſon employed to concert the affair with him. More muſt have been originally comprehended in the ſcheme than the mere deſertion of the American cauſe by Arnold: The ſurrender of Weſt-Point into the hands of the royal army, was the probable object; but whatever deſigns had been formed for promoting the views of the Britiſh government, they were fruſtrated by the apprehending of Major André. He was taken in diſguiſe, after having aſſumed a falſe name, on the 23d of September, by three American ſoldiers, to whom he offered conſiderable rewards if they would have ſuffered him to eſcape, but without effect. Several papers written by Arnold were found upon him; and when Arnold had learnt that Major André was ſeized, he found means to get on board a barge, and to eſcape to one of the king's ſhips.

346 Unhappy fate of Major André.

General Waſhington referred the caſe of Major André to the examination and deciſion of a board of general officers, conſiſting of Major-general Green, Major-general Lord Sterling, Major-general the Marquis de la Fayette, Major-general the Baron de Steuben, two other major-generals, and eight brigadier-generals. Major André was examined before them, and the particulars of his caſe inquired into; and they reported to the American commander in chief, that Mr André came on ſhore from the Vulture ſloop of war in the night, on an interview with General Arnold, in a private and ſecret manner; that he changed his dreſs within the American lines; and, under a feigned name, and in a diſguiſed habit, paſſed the American works at Stoney and Verplank's points, on the evening of the 22d of September; that he was taken on the morning of the 23d at Tarry-town, he being then on his way for New York: and that, when taken, he had in his poſſeſſion ſeveral papers which contained intelligence for the enemy. They therefore determined, that he ought to be conſidered as a ſpy from the enemy; and that, agreeable to the law and uſage of nations, he ought to ſuffer death. Sir Henry Clinton, Lieutenant-general Robertſon, and the late American general Arnold, all wrote preſſing letters to General Waſhington on the occaſion, in order to prevent the deciſion of the board of general officers from being put in force: But their applications were ineffectual. Major André was hanged at Tappan, in the province of New-York, on the 2d of October. He met his fate with great firmneſs; but appeared ſomewhat hurt that he was not allowed a more military death, for which he had ſolicited.

347 His amiable character.

He was a gentleman of very amiable qualities, had a taſte for literature and the fine arts, and poſſeſſed many accompliſhments. His death, therefore, was regretted even by his enemies; and the ſeeming ſeverity of the determination concerning him was much exclaimed againſt in Great Britain. It was, however, generally acknowledged by impartial perſons, that there was nothing in the execution of this unfortunate gentleman but what was perfectly conſonant to the rules of war.

348 Motives aſſigned by Arnold for his conduct.

Arnold was made a brigadier-general in the king's ſervice, and publiſhed an addreſs to the inhabitants of America, dated from New-York, October 7, in which he endeavoured to juſtify his deſertion of their cauſe. He ſaid, that when he firſt engaged in it, he conceived the rights of his country to be in danger, and that duty and honour called him to her defence. A redreſs of grievances was his only aim and object; and therefore he acquieſced unwillingly in the declaration of independence, becauſe he thought it precipitate. But what now induced him to deſert their cauſe was the diſguſt he had conceived at the French alliance, and at the refuſal of Congreſs to comply with the laſt terms offered by Great Britain, which he thought equal to all their expectations and to all their wiſhes.

349 Different reaſons alleged by the Americans.

The Americans, however, accounted for the conduct of Arnold in a different and in a more probable and ſatisfactory manner. They alleged that he had ſo involved himſelf in debts and difficulties by his extravagant manner of living in America, that he had rendered it very inconvenient for him to continue there: that after the evacuation of Philadelphia by the Britiſh troops, Arnold, being inveſted with the command in that city, had made the houſe of Mr Penn, which was the beſt in the city, his head-quarters. This he had furniſhed in an elegant and expenſive manner and lived in a ſtyle far beyond his income. It was manifeſt, they ſaid, that he could at firſt have no great averſion to the French alliance, becauſe that when M. Gerard, miniſter plenipotentiary from the court of France, arrived at Philadelphia in July 1778, General Arnold early and earneſtly ſolicited that miniſter, with his whole ſuite, to take apartments and bed and board at his houſe, until a proper houſe could be provided by the order of the congreſs. This offer M. Gerard accepted, and continued with him ſome weeks. The French miniſter reſided upwards of 14 months in Philadelphia; during which time General Arnold kept up the moſt friendly and intimate acquaintance with him, and there was a continued interchange of dinners, balls, routes, and concerts: ſo that M. Gerard muſt have believed, that in General Arnold he had found and left one of the warmeſt friends the court of France had in America. He was alſo one of the firſt in congratulating the Chevalier de la Luzerne, the ſecond French miniſter. About this time complaints and accuſations were exhibited againſt him by the government of Philadelphia for divers mal-practices; among which charges were, the appropriation of goods and merchandiſe to his own uſe, which he had ſeized as Britiſh property in Philadelphia in July 1778. It was determined by a court-martial that his conduct was highly reprehenſible; but he was indulgently treated, and was therefore only reprimanded by the commander in chief General Waſhington. It was in theſe circumſtances, the Americans ſaid, bankrupted in reputation and fortune, loaded with debts, and having a growing and expenſive family, that General Arnold firſt turned his thoughts towards joining the royal arms.

350
Actions in South-Carolina.

After the defeat of General Gates by Earl Cornwallis, that nobleman exerted himſelf to the utmoſt in extending the progreſs of the Britiſh arms, and with conſiderable effect. But one enterprize, which was conducted by Major Ferguſon, proved unſucceſsful. That officer had taken abundant pains to diſcipline ſome of the Tory militia, as they were termed; and with a party of theſe, and ſome Britiſh troops, amounting in the whole to about 1400 men, made incurſions into the country. But on the 7th of October he was attacked by a ſuperior body of Americans, at a place called King's-mountain, and totally defeated. One hundred and fifty were killed in the action, and 810 made priſoners, of which 150 were wounded. Fifteen hundred ſtands of arms alſo fell into the hands of the Americans, whoſe loſs was inconſiderable. But the following month Lieutenant-colonel Tarleton, with a party of 170, chiefly cavalry, attacked General Sumpter, who is ſaid to have had 1000 men, at a place called Black-Stocks, and obliged him to retire. Sumpter was wounded, and about 120 of the Americans killed, wounded, or taken. Of the Britiſh troops about 50 were killed and wounded.

351
Capture of Mr Laurens.

On the 3d of September, the Mercury, a congreſs packet, was taken by the Veſtal, Captain Keppel, near Newfoundland. On board this packet was Mr Laurens, late preſident of the congreſs, who was bound on an embaſſy to Holland. He had thrown his papers overboard, but great part of them were recovered without having received much damage. He was brought to London, and examined before the privy-council; in conſequence of which he was committed cloſe priſoner to the Tower on the 6th of October, on a charge of high treaſon. His papers were delivered to the miniſtry, and contributed to facilitate a rupture with Holland, as among them was found the ſketch of a treaty of amity and commerce between the republic of Holland and the United States of America.

352
Diſcontents among the American troops.

353
Revolt of the Penſylvania line.

At the beginning of the year 1781, an affair happened in America, from which expectations were formed by Sir Henry Clinton, that ſome conſiderable advantage might be derived to the royal cauſe. The long continuance of the war, and the difficulties under which the congreſs laboured, had prevented their troops from being properly ſupplied with neceſſaries and conveniencies. In conſequence of this, on the firſt of January, the American troops that were hutted at Morris-town, and who formed what was called the *Penſylvania line*, turned out, being in number 1300, and declared, that they would ſerve no longer, unleſs their grievances were redreſſed, as they had not received their pay or been furniſhed with the neceſſary clothing or proviſions. It is ſaid that they were ſomewhat inflamed with liquor, in conſequence of rum having been diſtributed to them more liberally than uſual, new-year's day being conſidered as a kind of feſtival. A riot enſued, in which an officer was killed, and four wounded; five or ſix of the inſurgents were alſo wounded. They then collected the artillery, ſtores, proviſions, and waggons, and marched out of the camp. They paſſed by the quarters of General Wayne, who ſent a meſſage to them, requeſting them to deſiſt, or the conſequences would prove fatal. They refuſed, and proceeded on their march till the evening, when they took poſt on an advantageous piece of ground, and elected officers from among themſelves. On the ſecond, they marched to Middlebrook, and on the third to Princetown, where they fixed their quarters. On that day a flag of truce was ſent to them from the officers of the American camp, with a meſſage, deſiring to know what were their intentions. Some of them anſwered, that they had already ſerved longer than the time for which they were enliſted, and would ſerve no longer; and others, that they would not return, unleſs their grievances were redreſſed. But at the ſame time they repeatedly, and in the ſtrongeſt terms, denied being influenced by the leaſt diſaffection to the American cauſe, or having any intentions of deſerting to the enemy.

354
Ineffectual attempts to induce them to join the royal army.

Intelligence of this tranſaction was ſoon conveyed to New-York. A large body of Britiſh troops were immediately ordered to hold themſelves in readineſs to move on the ſhorteſt notice, it being hoped that the American revolters might be induced to join the royal army. Meſſengers were alſo ſent to them from General Clinton, acquainting them that they ſhould directly be taken under the protection of the Britiſh government; that they ſhould have a free pardon for all former offences; and that the pay due to them from the congreſs ſhould be faithfully paid them without any expectation of military ſervice, unleſs it ſhould be voluntary, upon condition of their laying down their arms and returning to their allegiance. It was alſo recommended to them to move beyond the South River; and they were aſſured, that a body of Britiſh troops ſhould be ready to protect them whenever they deſired it. Theſe propoſitions were rejected with diſdain; and they even delivered up two of Sir Henry Clinton's meſſengers to the congreſs. Joſeph Reid, Eſq; preſident of the ſtate of Pennſylvania, afterwards repaired to them at Princeton, and an accommodation took place: ſuch of them as had ſerved out their full terms were permitted to return to their own homes, and others again joined the American army, upon receiving ſatisfactory aſſurances that their grievances ſhould be redreſſed.

355
Exertions of Lord Cornwallis in North-Carolina.

Lord Cornwallis now began to make very vigorous exertions, in order to penetrate into North-Carolina. On the 11th of January his Lordſhip's army was in motion, and advancing towards that province; but was ſomewhat delayed by an attempt made by the Americans, under General Morgan, to make themſelves maſters of the valuable diſtrict of Ninety-ſix. In order to prevent this, Lord Cornwallis detached Lieutenant-colonel Tarleton, with 300 cavalry, 300 light infantry, the 7th regiment, the firſt battalion of the 71ſt regiment, and two three-pounders, to oppoſe the progreſs of Morgan, not doubting but that he would be able to perform this ſervice effectually. The Britiſh troops came up with the Americans under General Morgan on the 17th of January. The Americans, two thirds of whom were militia, were drawn up in an open wood, at a place called the Cowpens, near Pacolet-river. The Britiſh, beſides their field-pieces, had the advantage of five to four in infantry, and of more than three to one in cavalry. The attack was begun by the firſt line of infantry, conſiſting of the 7th regiment, and a corps of light infantry with a troop of cavalry placed on each flank. The firſt battalion of the 71ſt and the remainder of the cavalry formed the reſerve. The American line ſoon gave way, and their militia quitted the field; upon which the royal troops, ſuppoſing the victory already gained, engaged with ardour in the purſuit, and were thereby thrown into ſome diſorder.

356 Defeat of Colonel Tarleton.

General Morgan's corps, who were ſuppoſed to have been routed, then immediately faced about, and threw in a heavy fire upon the King's troops, which occaſioned the utmoſt confuſion amongſt them; and they were at length totally defeated by the Americans. Four hundred of the Britiſh infantry were either killed, wounded, or taken priſoners: the loſs of the cavalry was much leſs conſiderable; but the two three-pounders fell into the hands of the Americans, together with the colours of the 7th regiment, and all the detachment of royal artillery were either killed or wounded in defence of their colours.

357 Operations in conſequence of that event.

Lieutenant-colonel Tarleton then retreated to Hamilton's ford, near the mouth of Bullock's creek, carrying with him part of his baggage, and deſtroying the remainder.

This defeat of the troops under Tarleton was a ſevere ſtroke to Lord Cornwallis, as the loſs of his light infantry was a great diſadvantage to him. The day after the event he employed in collecting the remains of Tarleton's corps, and in endeavouring to form a junction with General Leſlie, who had been ordered to march towards him with a body of Britiſh troops from Wynneſborough. Conſiderable exertions were then made by part of the army, without baggage, to retake the priſoners in the hands of the Americans, and to intercept General Morgan's corps on its retreat to the Catawba. But that American officer, after his defeat of Tarleton, had made forced marches up into the country, and croſſed the Catawba the evening before a great rain, which ſwelled the river to ſuch a degree, as to prevent the royal army from croſſing for ſeveral days; during which time the Britiſh priſoners were got over the Yadkin; whence they proceeded to Dan River, which they alſo paſſed, and on the 14th of February had reached Court-houſe, in the province of Virginia.

Lord Cornwallis employed a halt of two days in collecting ſome flour, and in deſtroying ſuperfluous baggage and all his waggons, excepting thoſe laden with hoſpital ſtores, ſalt, and ammunition, and four reſerved empty in readineſs for ſick or wounded.

358 Lord Cornwallis marches through North-Carolina.

Being thus freed from all unneceſſary incumbrances, he marched through North-Carolina with great rapidity, and penetrated to the remoteſt extremities of that province on the banks of the Dan. His progreſs was ſometimes impeded by parties of the militia, and ſome ſkirmiſhes enſued, but he met with no very conſiderable oppoſition. On the firſt of February the king's troops croſſed the Catawba at M'Cowan's Ford, where General Davidſon, with a party of American militia, was poſted, in order to oppoſe their paſſage; but he falling by the firſt diſcharge, the royal troops made good their landing, and the militia retreated. When Lord Cornwallis arrived at Hillſborough, he erected the king's ſtandard, and invited, by proclamation, all loyal ſubjects to repair to it, and to ſtand forth and take an active part in aſſiſting his Lordſhip to reſtore order and government. He had been taught to believe that the king's friends were numerous in that part of the country: but the event did not confirm the truth of the repreſentations that had been given. The Royaliſts were but few in number, and ſome of them too timid to join the king's ſtandard. There were, indeed, about 200 who were proceeding to Hillſborough, under colonel Pyle, in order to avow their attachment to the royal cauſe; but they were met accidentally, and ſurrounded by a detachment from the American army, by whom a number of them are ſaid to have been killed when they were begging for quarter, without making the leaſt reſiſtance. Meanwhile General Greene was marching with great expedition with the troops under his command, in order to form a junction with other corps of American troops, that he might thereby be enabled to put ſome effectual ſtop to the progreſs of Lord Cornwallis.

In other places ſome conſiderable advantages were obtained by the royal arms.

359 Large quantities of American ſtores deſtroyed by Arnold.

On the 4th of January, ſome ſhips of war with a number of tranſports, on board which was a large body of troops under the command of Brigadier-general Arnold, arrived at Weſtover, about 140 miles from the Capes of Virginia, where the troops immediately landed and marched to Richmond; which they reached without oppoſition, the militia that was collected having retreated on their approach. Lieutenant-colonel Simcoe marched from hence with a detachment of the Britiſh troops to Weſtham, where they deſtroyed one of the fineſt founderies for cannon in America, and a large quantity of ſtores and cannon. General Arnold, on his arrival at Richmond, found there large quantities of ſalt, rum, ſail-cloth, and tobacco, the laſt of which he deſtroyed to a very great amount. The Britiſh troops afterwards attacked and diſperſed ſome ſmall parties of the Americans, took ſome ſtores and a few pieces of cannon, and on the 20th of the ſame month marched into Portſmouth. On the 25th, Captain Barclay, with ſeveral ſhips of war, and a body of troops under the command of Major Craig, arrived in Cape-Fear River. The troops landed about nine miles from Wilmington, and on the 28th entered that town. It was underſtood that their having poſſeſſion of that town, and being maſters of Cape-Fear River, would be productive of very beneficial effects to Lord Cornwallis's army.

General Greene having effected a junction about the 10th of March with a continental regiment of what were called *eighteen months men*, and two large bodies of militia belonging to Virginia and North-Carolina, formed a reſolution to attack the Britiſh troops under the command of Lord Cornwallis. The American army marched from the High Rock Ford on the 12th of the month, and on the 14th arrived at Guildford. Lord Cornwallis, from the information he had received of the motions of the American general, concluded what were his deſigns.

360 Different ſkirmiſhes.

As they approached more nearly to each other, a few ſkirmiſhes enſued between ſome advanced parties, in which the advantage was ſometimes gained by the Americans and ſometimes by the Britiſh. On the morning of the 15th, Lord Cornwallis marched with his troops at day-break in order to meet the Americans or to attack them in their encampment.

ment. About four miles from Guildford, the advanced guard of the Britiſh army, commanded by Lieutenant-colonel Tarleton, fell in with a corps of the Americans, conſiſting of Lieutenant-colonel Lee's legion, ſome Back-Mountain men and Virginian militia, with whom he had a ſevere ſkirmiſh, and was, at length, obliged to retreat.

The greater part of the country in which the action happened is a wilderneſs, with a few cleared fields interſperſed. The American army was poſted on a riſing ground about a mile and a half from Guildford court-houſe. It was drawn up in three lines: the front line was compoſed of the North-Carolina militia, under the command of the generals Butler and Eaton; the ſecond line, of Virginian militia, commanded by the generals Stephens and Lawſon, forming two brigades; the third line, conſiſting of two brigades, one of Virginia and one of Maryland continental troops, commanded by General Huger and Colonel Williams. Lieutenant-colonel Waſhington, with the dragoons of the firſt and third regiments, a detachment of light infantry compoſed of continental troops, and a regiment of riflemen under colonel Lynch, formed a corps of obſervation for the ſecurity of their right flank. Lieutenant-colonel Lee, with his legion, a detachment of light infantry, and a corps of riflemen under Colonel Campbell, formed a corps of obſervation for the ſecurity of their left flank. The attack of the American army was directed to be made by Lord Cornwallis in the following order: On the right, the regiment of Boſe and the 71ſt regiment, led by Major-general Leſlie, and ſupported by the firſt battalion of guards; on the left, the 23d and 33d regiments, led by Lieutenant-colonel Webſter, and ſupported by the grenadiers and ſecond battalion of guards commanded by Brigadier-general O'Hara; the Yagers and light infantry of the guards remained in a wood on the left of the guns, and the cavalry in the road, ready to act as circumſtances might require.

361
Battle at Guildford.

About half an hour after one in the afternoon, the action commenced by a cannonade, which laſted about twenty minutes; when the Britiſh troops advanced in three columns and attacked the North-Carolinian brigades with great vigour, and ſoon obliged part of theſe troops to quit the field: but the Virginia militia gave them a warm reception, and kept up a heavy fire for a long time, till, being beaten back, the action became general almoſt every where. The American corps under the lieutenant-colonels Waſhington and Lee were alſo warmly engaged, and did conſiderable execution. Lieutenant-colonel Tarleton had directions to keep his cavalry compact, and not to charge without poſitive orders, excepting to protect any of the corps from the moſt evident danger of being defeated. The exceſſive thickneſs of the woods rendered the Britiſh bayonets of little uſe, and enabled the broken corps of Americans to make frequent ſtands with an irregular fire. The ſecond battalion of the guards firſt gained the clear ground near Guildford court-houſe, and found a corps of continental infantry, ſuperior in number, formed in an open field on the left of the road. Deſirous of ſignalizing themſelves, they immediately attacked and ſoon defeated them, taking two ſix pounders: but as they purſued the Americans into the wood with too much ardour, they were thrown into confuſion by a heavy fire, and inſtantly charged and driven back into the field by Lieutenant-colonel Waſhington's dragoons, with the loſs of the two ſix-pounders they had taken. But the American cavalry were afterwards repulſed, and the two ſix pounders again fell into the hands of the Britiſh troops.

362
The Americans defeated.

The Britiſh troops having at length broken the ſecond Maryland regiment, and turned the left flank of the Americans, got into the rear of the Virginia brigade, and appeared to be gaining their right, which would have encircled the whole of the continental troops, when General Greene thought it prudent to order a retreat. Many of the American militia diſperſed in the woods; but the continental troops retreated in good order to Reedy-Fork River, and croſſed at the ford about three miles from the field of action, and there halted. When they had collected their ſtragglers, they retreated to the iron-works, ten miles diſtant from Guildford, where they encamped. They loſt their artillery and two waggons laden with ammunition. It was a hard fought action, and laſted an hour and a half. Of the Britiſh troops, the loſs, as ſtated by Lord Cornwallis, was 532 killed, wounded, and miſſing. General Greene, in his account of the action tranſmitted to the Congreſs, ſtated the loſs of the continental troops to amount to 329 killed wounded, and miſſing; but he made no eſtimate of the loſs of the militia, which was ſomewhat more than 100. Lieutenant-colonel Stuart was killed in the action; and Lieutenant-colonel Webſter, and the captains Schutz, Maynard, and Goodriche, died of the wounds that had they received in it. Brigadier-general O'Hara, Brigadier-general Howard, and Lieutenant-colonel Tarleton, were alſo wounded. Of the Americans the principal officer killed was Major Anderſon of the Maryland line, and the generals Stephens and Huger were wounded.

363
Hardſhips endured by the Britiſh troops.

The Britiſh troops underwent great hardſhips in the courſe of this campaign; and in a letter of Lord Cornwallis's to Lord George Germain, dated March 17th, he obſerved, that "the ſoldiers had been two days without bread." His lordſhip quitted Guildford three days after the battle which was fought in that place; and on the 7th of April, after a retreat marked with proofs of great alarm and precipitation, arrived in the neighbourhood of Wilmington. Soon after, General Greene, notwithſtanding his late defeat, endeavoured to make ſome vigorous attempts againſt the king's forces in South-Carolina. Lord Rawdon had been appointed to defend the poſt of Camden, with about 800 Britiſh and provincials; and on the 19th of April General Greene appeared before that place with a large body of continentals and militia. He found it, however, impoſſible to attempt to ſtorm the town with any proſpect of ſucceſs; and therefore endeavoured to take ſuch a poſition as ſhould induce the Britiſh troops to ſally from their works.

364
General Greene attacked in his camp by Lord Rawdon, and defeated.

He poſted the Americans about a mile from the town, on an eminence which was covered with woods, and flanked on the left by an impaſſable ſwamp. But on the morning of the 25th, Lord Rawdon marched out of Camden, and attacked General Greene in his camp. The Americans made a vigorous reſiſtance, but were at length compelled to give way; and the purſuit is ſaid to have been continued three miles. For ſome time after the action commenced, General Greene entertained great hopes of defeating the Britiſh trops; in which, as the Americans were ſuperior in point of numbers, he would probably have ſucceeded, had not ſome capital military errors been committed by one or two of the officers who ſerved under him. On the American ſide Colonel Waſhington had behaved extremely well in this action, having made upwards of 200 of the Engliſh priſoners, with 10 or 12 officers, before he perceived that the Americans were abandoning the field of battle. The loſs of the Engliſh was about 100 killed and wounded. Upwards of 100 of the Americans were taken priſoners; and, according to the account publiſhed by General Greene, they had 126 killed and wounded. After this action, Greene retreated to Rugeley's mills, 12 miles from Camden, in order to collect his troops and wait for reinforcements.

Notwithſtanding the advantage which Lord Rawdon had obtained over General Greene at Camden, that nobleman ſoon after found it neceſſary, having burned the jail, mills, many private houſes, and a part of his own baggage, to quit that poſt; and the Americans made themſelves maſters of ſeveral other poſts that were occupied by the king's troops, and the garriſons of which were obliged to ſurrender themſelves priſoners of war. Theſe troops were afterwards exchanged under a cartel which took place between Lord Cornwallis and General Greene for the releaſe of all priſoners of war in the ſouthern diſtrict. After theſe events, General Greene laid cloſe ſiege to Ninety-ſix, which was conſidered as the moſt commanding and important of all the poſts in the back country; and on the 19th of June he attempted to ſtorm the garriſon, but was repulſed by the gallantry of the Britiſh troops, with the loſs of about 150 killed, wounded, and miſſing. General Greene then raiſed the ſiege, and retired with his army behind the Saluda, to a ſtrong ſituation, within 16 miles of Ninety-ſix.

365
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On the 18th of April a large body of Britiſh troops, under the command of Major-general Philips and Brigadier-general Arnold, embarked at Portſmouth in Virginia, in order to proceed on an expedition for the purpoſe of deſtroying ſome of the American ſtores. A party of light-infantry were ſent 10 or 12 miles up the Chickahomany; where they deſtroyed ſeveral armed ſhips, ſundry ware-houſes, and the American ſtate ſhip-yards. At Peterſburg, the Engliſh deſtroyed 4000 hogſheads of tobacco, one ſhip, and a number of ſmall veſſels on the ſtocks and in the river. At Cheſterfield court-houſe, they burnt a range of barracks for 2000 men and 300 barrels of flour. At a place called *Oſborn's*, they made themſelves maſters of ſeveral veſſels loaded with cordage and flour, and deſtroyed about 2000 hogſheads of tobacco, and ſundry veſſels were ſunk and burnt. At Warwick, they burnt a magazine of 500 barrels of flour, ſome fine mills belonging to Colonel Carey, a large range of public rope-walks and ſtore-houſes, tan and bark houſes full of hides and bark, and great quantities of tobacco. A like deſtruction of ſtores and goods was made in other parts of Virginia.

366
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of Ame-
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From the account already given of ſome of the principal military operations of the preſent year in America, it appears, that thought advantages had been gained by the royal troops, yet no event had taken place from which it could rationally be expected that the final termination of the war would be favourable to Great-Britain. It was alſo a diſadvantageous circumſtance, that there was a miſunderſtanding between Admiral Arbuthnot and Sir Henry Clinton, and a mutual diſapprobation of each other's conduct. This was manifeſt from their diſpatches to government, and eſpecially from thoſe of General Clinton, whoſe expreſſions reſpecting the conduct of the admiral were by no means equivocal.

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Miſunder-
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between
the Britiſh
admiral and
general.

On the 16th of March 1781, a partial action happened off the Capes of Virginia, between the fleet under Admiral Arbuthnot, conſiſting of ſeven ſhips of the line and one fifty-gun ſhip, and a French ſquadron conſiſting of the ſame number of ſhips of the line, and one forty-gun ſhip. Some of the ſhips in both fleets received conſiderable damage in the action, and the loſs of the Engliſh was 30 killed and 73 wounded; but no ſhip was taken on either ſide. The Britiſh fleet, however, claimed the advantage; as the French were obliged to retire, and were ſuppoſed to be prevented by this action from carrying troops upon the Cheſapeak, in order to attack General Arnold and impede the progreſs of Lord Cornwallis. But it was thought an unfortunate circumſtance, that ſome time before this engagement the Romulus, a ſhip of 44 guns, was captured by the French off the Capes of Virginia.

368
Action between the
Britiſh and
French
fleets off
the capes of
Virginia.

Lord Cornwallis, after his victory over General Greene at Guildford, proceeded, as we have ſeen, to Wilmington, where he arrived on the 7th of April. But before he reached that place, he publiſhed a proclamation, calling upon all loyal ſubjects to ſtand forth and take an active part in reſtoring good order and government; and declaring to all perſons who had engaged in the preſent rebellion againſt his majeſty's authority, but who were now convinced of their error, and deſirous of returning to their duty and allegiance, that if they would ſurrender themſelves with their arms and ammunition at head-quarters, or to the officer commanding in the diſtricts contiguous to their reſpective places of reſidence, on or before the 20th of that month, they would be permitted to return to their homes upon giving a military parole; they would be protected, in their perſons and properties, from all ſorts of violence from the Britiſh troops; and would be reſtored, as ſoon as poſſible, to all the privileges of legal and conſtitutional government. But it does not appear that any conſiderable number of the Americans were allured by theſe promiſes to give any evidences of their attachment to the royal cauſe.

369
Proclamation by
Lord Cornwallis.

On the 20th of May, his Lordſhip arrived at Peterſburg in Virginia, where he joined a body of Britiſh troops that had been under the command of Major-general Philips; but the command of which, in conſequence of the death of that officer, had devolved upon Brigadier-general Arnold. Before this junction he had encountered conſiderable inconveniences from the difficulty of procuring proviſions and forage; ſo that in a letter to Sir Henry Clinton, he informed him, that his cavalry wanted every thing, and his infantry every thing but ſhoes. He added, that he had experienced the diſtreſſes of marching hundreds of miles in a country chiefly hoſtile, without one active or uſeful friend, without intelligence, and without communication with any part of the country.

On the 26th of June, about ſix miles from Williamſburg

370 Different actions.

amſburg, Lieutenant-colonel Simcoe, and 350 of the queen's rangers, with 80 mounted yagers, were attacked by a much ſuperior body of the Americans; but whom they repulſed with great gallantry and with equal ſucceſs, making four officers and twenty private men priſoners. The loſs of the Americans in this action is ſaid to have been upwards of 120, and that of the Britiſh troops not more than 40.

On the 6th of July an action happened near the Green Springs in Virginia, between a reconnoitring party of the Americans under General Wayne, amounting to about 800, and a large part of the Britiſh army under Lord Cornwallis; in which the Americans had 127 killed and wounded, and the loſs of the royal troops is ſuppoſed to have been conſiderably greater. It was an action in which no ſmall degree of military ſkill and courage was exhibited by the Americans. In a variety of ſkirmiſhes, the Marquis de la Fayette very much diſtinguiſhed himſelf, and diſplayed the utmoſt ardour in the American cauſe.

371 General Greene defeats Col. Stuart.

In South-Carolina, an action happened on the 9th of September near the Eutaw Springs, between a large body of Britiſh troops under the command of Lieutenant-colonel Stuart and an equal body of Americans, under the command of General Greene. It was an obſtinate engagement, and laſted near two hours. The Britiſh, with a conſiderable loſs, were in the firſt part of the battle routed in all quarters, but ſome having taken poſt in a piquetted garden, and others thrown themſelves into a brick houſe, the eagerneſs of the American purſuit was conſiderably checked, and gave Colonel Stuart an opportunity on the evening of the next day, to abandon the Eutaw, and march towards Charleſton, taking a number of his wounded, and about one thouſand ſtand of arms.

372 Expedition againſt New-London.

In the courſe of the ſame month, General Arnold was ſent on an expedition againſt New-London, in Connecticut, where he deſtroyed a great part of the ſhipping, and an immenſe quantity of naval ſtores, European manufactures, and Eaſt and Weſt India commodities. The town itſelf was alſo burnt, which is ſaid, but untruly, to have been unavoidable, on account of the exploſions of great quantities of gun-powder which happened to be in the ſtore-houſes that were ſet on fire. A fort, of which it was thought neceſſary to gain poſſeſſion in this expedition, was not taken without conſiderable loſs. This was Fort-Griſwold; which was defended by the Americans with great gallantry, and the aſſault was made by the Engliſh with equal bravery. The Britiſh troops entered the works with fixed bayonets, and were oppoſed with great vigour by the garriſon with long ſpears. After a moſt obſtinate defence of near forty minutes, the aſſailants gained poſſeſſion of the fort, in which 85 Americans were found dead, and 60 wounded, moſt of them mortally; but of the killed, it is painful to obſerve, that the greater number fell after the Britiſh entered the fort, and when reſiſtance had ceaſed. Of the Britiſh troops Major Montgomery was killed by a ſpear in entering the American works; and 192 men were alſo killed and wounded in this expedition.

373 Critical ſituation of Lord Cornwallis.

Notwithſtanding the advantages that Lord Cornwallis had obtained over the Americans, his ſituation in Virginia began by degrees to be very critical; and the rather becauſe he did not receive thoſe reinforcements and ſupplies from Sir Henry Clinton, of which he had formed expectations, and which he conceived to be neceſſary to the ſucceſs of his operations. Indeed, the commander in chief was prevented from ſending thoſe reinforcements to Lord Cornwallis which he otherwiſe might have done, by his fears reſpecting New-York, againſt which he entertained great apprehenſions that General Waſhington intended to make a very formidable attack. In fact, that able American general appears to have taken much pains, and to have employed great fineſſe, in order to lead Sir Henry Clinton to entertain this imagination. Letters, expreſſive of this intention, fell into the hands of Sir Henry, which many conceived to have been written with a deſign that they ſhould be intercepted, and only with a view to amuſe and deceive the Britiſh general. The project, if ſo intended, was ſucceſsful; and by a variety of judicious military manœuvres, in which he completely out-generalled the Britiſh commander, he increaſed his apprehenſions about New-York, and prevented him from ſending proper aſſiſtance to Lord Cornwallis. Having for a conſiderable time kept Sir Henry Clinton in perpetual alarm in New-York, though with an army much inferior to the garriſon of that city, General Waſhington ſuddenly quitted his camp at White-Plains, croſſed the Delaware, and marched towards Virginia, apparently with a deſign to attack Lord Cornwallis. Sir Henry Clinton then received information, that the Count de Graſſe, with a large French fleet, was expected every moment in the Cheſapeak, in order to co-operate with General Waſhington. He immediately endeavoured, both by land and water, to communicate this information to Lord Cornwallis; and alſo ſent him aſſurances, that he would either reinforce him by every poſſible means in his power, or make the beſt diverſion he could in his favour. In the mean time, Lord Cornwallis had taken poſſeſſion of the poſts of York-town and Glouceſter in Virginia, where he fortified himſelf in the beſt manner he was able.

374 Ineffectual attempts to afford him aſſiſtance.

On the 28th of Auguſt, Sir Samuel Hood, with a ſquadron from the Weſt-Indies, joined the ſquadron under the command of Admiral Graves before New-York. It was then neceſſary, on account of the ſituation of Lord Cornwallis, that they ſhould immediately proceed to the Cheſapeak; but ſome time appears to have been needleſsly loſt, though Admiral Hood was extremely anxious that no delay might be made. They arrived, however, in the Cheſapeak, on the 5th of September, with 19 ſhips of the line; where they found the Count de Graſſe, who had anchored in that bay on the 30th of Auguſt with 24 ſhips of the line. The French admiral had previouſly landed a large body of troops, which had been brought from Rhode-Iſland, and who immediately marched to join the American army under General Waſhington. The Britiſh and French fleets came to an action on the ſame day in which the former arrived in the Cheſapeak. On board the Britiſh fleet 90 were killed and 246 wounded: ſome of the ſhips were greatly damaged in the engagement; and the Terrible, a 74 gun ſhip, was ſo much ſhattered, that it was afterwards found neceſſary to ſet fire to it. That this action had not been favourable to the Engliſh, was manifeſt from the event: the fleets continued in ſight of each other for five days ſucceſſively,

375 Action between the Britiſh and French fleets off the Cheſapeak.

ceſſively, and ſometimes were very near; but at length the French fleet all anchored within the Cape, ſo as to block up the paſſage. Admiral Graves, who was the commander in chief, then called a council of war, in which it was reſolved that the fleet ſhould proceed to New-York, that the ſhips might be there put into the beſt ſtate for the ſervice: and thus were the French left maſters of the navigation of the Cheſapeak.

Before the news of this action had reached New-York, a council of war was held there, in which it was reſolved, that 5000 men ſhould be embarked on board the king's ſhips, in order to proceed to the aſſiſtance of Lord Cornwallis. But when it was known that the French were abſolute maſters of the navigation of the Cheſapeak, it was thought inexpedient to ſend off that reinforcement immediately. In another council of war, it was reſolved, that as Lord Cornwallis had proviſions to laſt him till the end of October, it was adviſable to wait for more favourable accounts from Admiral Graves, or for the arrival of Admiral Digby, who was expected with three ſhips of the line. It was not then known at New-York, that Admiral Graves had determined to return with the whole fleet to that port.

376
Danger of Lord Cornwallis increaſed.

In the mean time, the moſt effectual meaſures were adopted by General Waſhington for ſurrounding the Britiſh army under Lord Cornwallis. A large body of French troops under the command of Lieutenant-General the Count de Rochambeau, with a very conſiderable train of artillery, aſſiſted in the enterpriſe. The Americans amounted to near 8000 continentals and 5000 militia. General Waſhington was inveſted with the authority of commander in chief of the combined forces of America and France. On the 29th of September, the inveſtment of York-Town was complete, and the Britiſh army quite blocked up. The day following, Sir Henry Clinton wrote a letter to Lord Cornwallis, containing aſſurances that he would do every thing in his power to relieve him, and ſome information concerning the ſteps that would be taken for that purpoſe. A duplicate of this letter was ſent to his Lordſhip by Major Cochran on the 3d of October. That gentleman, who was a very gallant officer, went in a veſſel to the Capes, and made his way to Lord Cornwallis, through the whole French fleet, in an open boat. He got to York-Town on the 10th of the month; and ſoon after his arrival had his head carried off by a cannon ball.

After the return of Admiral Graves to New-York, a council of war was held, conſiſting of flag and general officers; in which it was reſolved, that a large body of troops ſhould be embarked on board the king's ſhips as ſoon as they were refitted, and that the exertions of both fleet and army ſhould be made in order to form a junction with Lord Cornwallis. Sir Henry Clinton himſelf embarked on board the fleet, with upwards of 7000 troops, on the 18th; they arrived off Cape Charles, at the entrance of the Cheſapeak, on the 24th, where they received intelligence that Lord Cornwallis had been obliged to capitulate five days before.

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Late arrival of General Clinton.

378
Lord Cornwallis [illegible] obliged [illegible]

It was on the 19th of October that Lord Cornwallis ſurrendered himſelf and his whole army, by capitulation, priſoners to the combined armies of America and France, under the command of General Waſhington. He made a defence ſuitable to the character he had before acquired, for courage and military ſkill; but was compelled to ſubmit to untoward circumſtances and ſuperior numbers. It was agreed by the articles of capitulation, that the Britiſh troops were to be priſoners to the United States of America, and the ſeamen to the French king, to whoſe officers alſo the Britiſh veſſels found at York-Town and Glouceſter were to be delivered up. The Britiſh priſoners amounted to more than 7000; but many of them, at the time of ſurrender, were incapable of duty. A conſiderable number of cannon, and a large quantity of military ſtores, fell into the hands of the Americans on this occaſion. The honour of marching out with military colours, was refuſed to Lord Cornwallis, as it had been refuſed to General Lincoln; who was now ſelected to receive the ſubmiſſion of the royal army at York-Town in the ſame manner his own ſubmiſſion had been received by the Britiſh about 18 months before at Charleſton.

As no rational expectation now remained of a ſubjugation of the colonies, the military operations that ſucceeded in America were of little conſequence. Some inconſiderable actions and ſkirmiſhes did indeed take place after that event; in which the refugees chiefly diſtinguiſhed themſelves, and diſcovered an inveterate animoſity againſt the Americans. On the 5th of May 1782, Sir Guy Carleton arrived at New-York, being appointed to the command of the Britiſh troops in America in the room of Sir Henry Clinton. Two days after his arrival, he wrote a letter to General Waſhington, acquainting him, that Admiral Digby was joined with himſelf in a commiſſion to treat of peace with the people of America; tranſmitting to him, at the ſame time, ſome papers tending to manifeſt the pacific diſpoſition of the government and people of Britain towards thoſe of America. He alſo deſired a paſſport for Mr Morgan, who was appointed to tranſmit a ſimilar letter of compliment to the congreſs. General Waſhington declined ſigning any paſſport till he had taken the opinion of congreſs upon that meaſure; and by them he was directed to refuſe any paſſport for ſuch a purpoſe. However, another letter was ſent to General Waſhington, dated the 2d of Auguſt, ſigned by Sir Guy Carleton and Rear-admiral Digby, in which they informed him, that they were acquainted by authority that negociations for a general peace had already commenced at Paris; that Mr Grenville was inveſted with full powers to treat with all the parties at war; and was then at Paris in the execution of his commiſſion. They farther informed him, that his Britannic majeſty, in order to remove all obſtacles to that peace which he ſo ardently wiſhed to reſtore, had commanded his miniſters to direct Mr Grenville, that the independency of the thirteen provinces ſhould be propoſed by him, in the firſt inſtance, inſtead of making it the condition of a general treaty. But ſome jealouſies were entertained by the Americans, that it was the deſign of the Britiſh court either to diſunite them, or to bring them to treat of a peace ſeparately from their ally the king of France: they therefore reſolved, that any man, or body of men, who ſhould preſume to make any ſeparate or partial convention or agreement with the king of Great-Britain, or with any commiſſioner or commiſſioners under the crown of Great-Britain, ought to be conſidered and treated as open and avowed enemies of

379
Sir Guy Carleton arrives at New-York, with powers to treat of peace.

380
Reſolutions of congreſs in conſequence thereof.

of the United States of America; and alſo that thoſe ſtates could not with propriety hold any conference or treaty with any commiſſioners on the part of Great Britain, unleſs they ſhould, as a preliminary thereto, either withdraw their fleets and armies, or elſe, in poſitive or expreſs terms, acknowledge the independence of the ſaid ſtates. They likewiſe reſolved, that any propoſitions which might be made by the court of Great Britain, in any manner tending to violate the treaty ſubſiſting between them and the king of France, ought to be treated with every mark of indignity and contempt.

381 Different places evacuated by the Britiſh troops.

In the month of June, the town of Savannah, and the whole province of Georgia, were evacuated by the Britiſh troops; as was alſo Charleſton, South-Carolina, about the cloſe of the year. In the mean time, the negociations for peace being continued, proviſional articles of peace were ſigned at Paris on the 30th of November by the commiſſioner of his Britannic Majeſty and the American commiſſioners, in which his Majeſty acknowledged the united colonies of New-Hampſhire, Maſſachuſetts-Bay, Rhode-Iſland, and Providence Plantations, Connecticut, New-York, New-Jerſey, Penſylvania, Delaware, Maryland, Virginia, North-Carolina, South-Carolina, and Georgia, to be "free, ſovereign, and independent ſtates." They had conſtituted themſelves ſuch on the 4th of July 1776; they had been acknowledged ſuch by the French king on the 30th of January 1778, when he concluded with them a treaty of amity and commerce; Holland had acknowledged them as ſuch April 19th 1782; Sweden acknowledged them as ſuch February 5th 1783; Denmark the 25th February, Spain in March, and Ruſſia in July, the ſame year.

382 Independency of America acknowledged.

383 The American army diſbanded, and Gen. Waſhington reſigns his commiſſion.

The Definitive Treaty was ſigned on the 3d of September 1783; and, on the 25th of November following, the Britiſh troops evacuated New-York, which was immediately entered by the Americans in a joyful and well-conducted proceſſion, headed by General Waſhington and Governor Clinton. Soon after this event, the ſoldiers of the American army, chearfully reſuming the character of citizens, returned peaceably to their reſpective homes; while their beloved and ever-honoured commander, having taken a pathetic leave of his officers, repaired to Annapolis, and, on the 19th of December, at an audience with Congreſs (perhaps the moſt ſingular and intereſting that ever occurred) reſigned his commiſſion into the hands of the preſident of that honourable body, amidſt the acclamations of his grateful and admiring countrymen.

384 Loſs of men and treaſure by the war.

According to the report of the committee appointed for that purpoſe, *the Foreign Debt* of the United States incurred by the war, amounted to 7,885,085 dollars, and the *Domeſtic Debt* to 34,115,290, total, at 4s. 6d. each, equal to 9,450,084l. Sterling, the intereſt of which at 6 *per cent.* is 567,005l. But the coſt to Great Britain is moderately computed at 115,654,914l. and the additional annual burthen by it 4,557,575l. ſince January 1775. As to the loſs of men during this unhappy war, the States of America, according to authentic eſtimates, loſt by the ſword and in priſon near 80,000 men; and by the Britiſh returns at New-York, the number of ſoldiers killed in the ſervice amounted to 43,633.

Of the extent of territory, population, commerce, revenues and wealth of this growing empire; and, alſo, of the riſe, progreſs, and eſtabliſhment of the preſent happy form of government, a particular account ſhall be given, under the article UNITED STATES.

AMERICAN NIGHT-SHADE. See PHYTOLACCA.

AMERICAN GROUND-NUT. See ARRACHIS.

AMERICUS VESPUCIUS, a Florentine gentleman, from whom *America* derived its name.—The merchants of Seville having obtained permiſſion to attempt diſcoveries as private adventurers, ſent out four ſhips in 1499, under the command of Alonzo de Ojeda (who had accompanied Columbus in his ſecond voyage), aſſiſted by Americus Veſpucius, who was known to be deeply ſkilled in the ſcience of navigation. This fleet touched on that part of the weſtern continent already diſcovered by Columbus, whoſe track Ojeda followed; and Americus, who was a man of much addreſs, as well as poſſeſſed of conſiderable literary talents, by publiſhing the firſt voyages on the ſubject, and other artful means, gave his name to the New-World, in prejudice to the illuſtrious Genoeſe. The impoſture, though long detected, has been ſanctified by time: and the fourth diviſion of the globe, ſo long unknown to the inhabitants of Europe, Aſia, and Africa, ſtill continues to be diſtinguiſhed by the name of AMERICA.

AMERSFORT, a city in the Netherlands, in the province of Utrecht, ſeated on the river Ems, E. Long. 5. 20. N. Lat. 52. 14. The moſt remarkable things are, The town-houſe; the grand palace, which is triangular; the public walk, planted with trees; and the great church, dedicated to St George. The land to the eaſt and ſouth of this city is very fruitful; on the north there is nothing but paſture-ground, and on the weſt it is woody. Not far from hence is a mountain called *Amersfort-berg*, on which they have planted a viſta of trees, which reaches to Utrecht.

AMERSHAM, or AGMONDESHAM, a market-town in Buckinghamſhire, conſiſting of about 200 houſes, with a free-ſchool, and four alms-houſes. It ſends two members to parliament, and has a market on Tueſday. It is a rectory rated at 48l. 16s. 8d. in the king's books. The market-houſe is a very handſome ſtructure. W. Long. 0. 15. N. Lat. 51. 47.

AMES (William, D. D.) a learned independent divine, famous for his controverſial writings, was born in 1576, and educated at Chriſt's college, in Cambridge. In the reign of King James I. he left the univerſity, and ſoon after the kingdom, on account of his being unwilling to conform to the rules of the church; and retired to the Hague, where he had not been long before he was invited to accept of the divinity-chair in the univerſity of Franeker, in Frieſland, which he filled with admirable abilities for above twelve years; during which his fame was ſo great, that many came from remote nations to be educated under him. He from thence removed to Rotterdam for a change of air, which his health demanded; and here he continued during the remainder of his life. His controverſial writings, which compoſe the greateſt part of his works, are chiefly againſt Bellarmine and the Arminians. He alſo wrote, 1. A freſh Suit againſt the Ceremonies. 2. *Lectiones in Pſalmos Davidis*. 3. *Medulla Theologiæ*; and ſeveral pieces relative to the ſciences. He died of an aſthma, at Rotterdam, in Nov. 1633.

AMESTRATA, a town of Sicily, (Cicero); *Ameſtratos*, (Stephanus); *Amaſtra* (Silius Italicus); *Multiſtratos*, (Polybius): Now *Miſtretta*, in the Val di Demona, on the river Haleſus. It was a very ſtrong fort of the Carthaginians, beſieged in vain by the Romans for ſeven months with conſiderable loſs; at length, after another ſiege taken and razed (Diodor. Siculus).

AMETHYST, a tranſparent gem of a purple colour, which ſeems compoſed of a ſtrong blue and a deep red; and, according as either of thoſe prevails, affording different tinges of purple, ſometimes approaching to violet, and ſometimes even fading to a pale-roſe colour. Though the amethyſt is generally of a purple colour, it is nevertheleſs ſometimes found naturally colourleſs, and may at any time be eaſily made ſo by puting it into the fire; in which pellucid or colourleſs ſtate, it ſo reſembles the diamond, that its want of hardneſs ſeems the only way of diſtinguiſhing it. Some derive the name *amethyſt* from its colour, which reſembles wine mixed with water; whilſt others, with more probability, think it got its name from its ſuppoſed virtue of preventing drunkenneſs; an opinion which, however imaginary, prevailed to that degree among the ancients, that it was uſual for great drinkers to wear it about their necks. Be this as it will, the amethyſt is ſcarce inferior to any of the gems in the beauty of its colour; and in its pureſt ſtate is of the ſame hardneſs, and at leaſt of equal value, with the ruby and ſapphire. It is found of various ſizes, from the bigneſs of a ſmall vetch, to an inch and an half in diameter, and often to much more than that in length. Its ſhape is extremely various, ſometimes roundiſh, ſometimes oblong, and at others flatted, at leaſt on one ſide; but its moſt common appearance is in a cryſtalliform figure, conſiſting of a thick column, compoſed of four plants, and terminated by a flat and ſhort pyramid, of the ſame number of ſides; or elſe, of a thinner and longer hexangular column; and ſometimes of a long pyramid, without any column. It makes the gayeſt figure in the laſt of theſe ſtates, but is hardeſt and moſt valuable in the roundiſh and pebble-like form. The amethyſt is found in the Eaſt and Weſt-Indies, and in ſeveral parts of Europe; the oriental ones, at leaſt ſome of the finer ſpecimens, being ſo hard and bright as to equal any of the coloured gems in value. However, by far the greater number of amethyſts fall infinitely ſhort of theſe; as all the European ones, and not a few of thoſe brought from the Eaſt and Weſt-Indies, are very little harder than common cryſtal.

Counterfeit or Factitious AMETHYST. Spars and cryſtals tinged red and yellow, &c. are ſold for amethyſts. The falſe ones come from Germany, are tinged by vapours in the mines, and contain ſome lead.

Amethyſts may be counterfeited by glaſs, to which the proper colour or ſtain is given. There were fine ones made in France about the year 1690, which may even impoſe on connoiſſeurs, unleſs the ſtone be taken out of the collet.—The method of giving this colour to glaſs is directed as follows: Take chryſtal-frit, made with the moſt perfect and fine tarſo: Then prepare a mixture of manganeſe in powder, one pound; and zaffer prepared, one ounce and a half: Mix theſe powders well together; and add to every pound of the frit an ounce of this powder. Let it be put into the pots with the frit, not into the already made metal. When the whole has ſtood long enough in fuſion to be perfectly pure, work it into veſſels, and they will reſemble the colour of the amethyſt.

AMETHYST in heraldry, a term for the purple colour in the coat of a nobleman, in uſe with thoſe who blazon with precious ſtones, inſtead of metals and colours. This, in a gentleman's eſcutcheon, is called *Purpure*; and in thoſe of ſovereign princes, *Mercury*.

AMETHYSTEA, AMETHYST: a genus of the monogynia order, belonging to the diandria claſs of plants; and, in the natural method, ranking under the 42d order, *Verticillatæ*. The characters are: The *calyx* conſiſts of a ſingle-leaved perianthium, bell-ſhaped, angular, ſemiquinquefid, and perſiſtent: The *corolla* is monopetalous; the border quinquepartite, the loweſt diviſion more expanding: The *ſtamina* conſiſt of two ſlender filaments approximated; the antheræ are ſimple and roundiſh: The *piſtillum* has a four-cleft germen; ſtylus, the ſize of the ſtamina; ſtigmata two, acute: No *corolla:* The *ſeeds* four, gibbous, and ſhorter than the calyx:—There is only one known ſpecies.

This plant is a native of Siberia, from whence the ſeeds were ſent to the imperial garden at Peterſburgh, and thence carried to Britain. It is an annual plant, with an upright ſtalk, which riſes about a foot high. Towards the top it puts forth two or three ſmall lateral branches, garniſhed with ſmall trifid leaves, ſawed on their edges, of a very dark green colour. The flowers appear in June or July, and are produced in ſmall umbels at the extremities of the branches. They are of a fine blue colour, as are alſo the upper part of the branches, and the leaves immediately under the umbel, ſo that they make a fine appearance.

Culture. The ſeeds of the amethyſtea ſhould be ſown in autumn, as they are apt to remain a whole year in the ground, if kept till the ſpring. When the plants come up, nothing elſe is neceſſary than to keep them clear of weeds, and to thin them where they are too cloſe. They ought to be ſown where they are to remain, as they do not thrive when tranſplanted.

AMETHYSTINE is applied, in antiquity, to a kind of purple garment dyed of the hue of amethyſt. In this ſenſe amethyſtine differed from *Tyrian* as well as from *hyacinthine* purple, being a kind of medium between both.

AMHAR, or AMHARA, a province of Abyſſinia, ſaid to extend 40 leagues from eaſt to weſt. It is conſidered as the moſt noble in the whole empire, both on account of its being the uſual reſidence of the Abyſſinian monarchs, and having a particular dialect different from all the reſt, which, by reaſon of the emperors being brought up in this province, is become the language of the court and of the politer people. Here is the famed rock Amba-geſhen, where the young monarchs were formerly confined. See AMBA.

AMHURST (Nicholas), an Engliſh poet and political writer, was born at Marden in Kent, and entered of St John's college Oxford; from whence he was expelled for irregularity of conduct and libertine principles. Retaining great reſentment againſt the univerſity on this account, he abuſed its learning and diſcipline, and ſome of the moſt reſpectable characters in it, in a poem publiſhed in 1724, called *Oculus Britanniæ*, and in a book intitled *Terræ Filius*. He publiſhed a Miſcellany

lany of Poems, ſacred and profane; and, The Convocation, a poem in five cantos, which was a ſatire on the Biſhop of Bangor's antagoniſts. But he is beſt known for the ſhare he had in the political paper called *The Craftſman:* though, after having been the drudge of his party for near 20 years, he was as much forgot in the famous compromiſe of 1742 as if he had never been born; and, when he died in that year of a broken heart, was indebted to the charity of his bookſeller for a grave.

AMIANTHUS, or Earth-flax, in natural hiſtory, a fibrous, flexile, elaſtic, mineral ſubſtance, conſiſting of ſhort, abrupt, and interwoven filaments. It is found in Germany, in the ſtrata of iron ore, ſometimes forming veins of an inch in diameter. Its fibres are ſo flexible that cloth has been made of them, and the ſhorter filaments that ſeparate in the waſhing of the ſtone may be made into paper in the common manner. For the method of its preparation for manufacture into cloth, ſee Asbestos.

Amianthus is claſſed by Mr Kirwan in the muriatic genus of earths, becauſe it contains about a fifth part of magneſia. Its other conſtituents, are, flint, mild calcareous earth, barytes, clay, and a very ſmall proportion of iron. It is fuſible *per ſe* in a ſtrong heat, and alſo with the common fluxes. It differs from aſbeſtos in containing ſome ponderous earth.

AMICABLE, in a general ſenſe, denotes any thing done in a friendly manner, or to promote peace.

Amicable-Benches, in Roman antiquity, were, according to Pitiſcus, lower and leſs honourable ſeats allotted for the *judices pedanei*, or inferior judges, who, upon being admitted of the emperor's council, were dignified by him with the title *amici*.

Amicable-Numbers, ſuch as are mutually equal to the ſum of one another's aliquot parts. Thus the numbers 284 and 220 are amicable numbers: for the aliquot parts, 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110, of 220, are together equal to the other number 284; and the aliquot parts 1, 2, 4, 71, 142, of 284, are together equal to 220.

AMICTUS, in Roman antiquity, was any upper garment worn over the tunica.

Amictus, among eccleſiaſtical writers, the uppermoſt garment anciently worn by the clergy; the other five being the alba, ſingulum, ſtola, manipulus, and planeta. The amictus was a linen garment, of a ſquare figure, covering the head, neck, and ſhoulders, and buckled or claſped before the breaſt. It is ſtill worn by the religious abroad.

AMICULUM, in Roman antiquity, a woman's upper garment, which differed from the pala. It was worn both by matrons and courtezans.

AMICUS curiæ, a law-term, to denote a byſtander who informs the court of a matter in law that is doubtful or miſtaken.

AMIDA, a god worſhipped by the Japaneſe, who has many temples erected to him in the iſland of Japan, of which the principal is at Jedo. The Japaneſe have ſuch a confidence in their idol Amida, that they hope to obtain eternal felicity by the frequent invocation of his name. One of the figures of this idol is repreſented at Rome.

Amida (anc. geog.), a principal city of Meſopotamia (Liber Notitiæ); *Ammæa* (Ptolemy); ſituated on a high mountain, on the borders of Aſſyria, on the Tigris, where it receives the Nymphius.—It was taken from the Romans, in the time of the emperor Conſtans, by Sapores king of Perſia. The ſiege is ſaid to have coſt him 30,000 men; however, he reduced it to ſuch ruin, that the emperor afterwards wept over it. According to Ammianus Marcellinus, the city was razed; the chief officers were crucified; and the reſt, with the ſoldiers and inhabitants, either put to the ſword or carried into captivity, except our hiſtorian himſelf, and two or three more, who, in the dead of the night, eſcaped through a poſtern unperceived by the enemy. The inhabitants of Niſibis, however, being obliged to leave their own city by Jovian's treaty with the Perſians, ſoon reſtored Amida to its former ſtrength; but it was again taken by Cavades in 501, but was reſtored to the Romans in 503. On the declenſion of the Roman power, it fell again into the hands of the Perſians; but was taken from them by the Saracens in 899. It is now in the poſſeſſion of the Turks. Here are above 20,000 Chriſtians, who are better treated by the Turks than in other places. A great trade is carried on in this city, of red Turkey leather, and cotton cloth of the ſame colour. The Arabian name of Amida is *Diarbeker*, and the Turkiſh one *Kara Amed*. E. Long. 39. 0. N. Lat. 36. 58.

AMIENS, a large handſome city of France, the capital of Picardy. It is agreeably ſituated on the river Somme, and ſaid to have received its Latin name *Ambianum* from being every where encompaſſed with water. It is a place of great antiquity; being mentioned by Cæſar as a town that had made a vigorous reſiſtance againſt the Romans, and where he convened a general aſſembly of the Gauls after having made himſelf maſter of it. The emperors Antoninus and Marcus Aurelius enlarged it; and Conſtantine, Conſtans, Julian, and ſeveral others, reſided here a conſiderable time. The town is encompaſſed with a wall and other fortifications; and the ramparts are planted with trees, which form a delightful walk. The river Somme enters Amiens by three different channels, under as many bridges; and theſe channels, after waſhing the town in ſeveral places, where they are of uſe in its different manufactures, unite at the other end by the bridge of S. Michael. Here is a quay for the boats that come from Abbeville with goods brought by ſea. At the gate of Noyon there is a ſuburb remarkable for the abbey of S. Achen. Next to this gate you come to that of Paris, where they have a long mall between two rows of trees. The houſes are well built; the ſtreets ſpacious, embelliſhed with handſome ſquares and good buildings; and the number of inhabitants between 40 and 50 thouſand. The cathedral, dedicated to our Lady, is one of the largeſt and moſt magnificent churches in France; adorned with handſome paintings, fine pillars, chapels, and tombs; particularly the nave is greatly admired. The other places worth ſeeing are the palace of the bailiwic, the town-houſe, the ſquare *des Fleurs*, and the great market-place.

Amiens was taken by the Spaniards, in 1597, by the following ſtratagem: Soldiers, diſguiſed like peaſants, conducted a cart laden with nuts, and let a bag of them fall juſt as the gate was opened. While the guard was buſy in gathering up the nuts, the Spaniards entered and became maſters of the town. It was retaken by Henry IV. who built a citadel there.

This town is the ſeat of a biſhop, ſuffragan of Rheims, as alſo of a preſidial, bailiwic, vidam, a chamber of accounts, and a generality. The biſhop's revenue is 30,000 livres. They have ſome linen and woolen manufactures, and they alſo make a great quantity of black and green ſoap. It lies in E. Long. 2. 30. N. Lat. 49. 50.

AMILCAR, the name of ſeveral Carthaginian captains. The moſt celebrated of them is Amilcar Barcas, the father of Hannibal, who during five years infeſted the coaſt of Italy; when the Romans, ſending out their whole naval ſtrength, defeated him near Trapani, 242 years before Chriſt; and thus put an end to the firſt Punic war. Amilcar began the ſecond, and landed in Spain, where he ſubdued the moſt warlike nations; but as he was preparing for an expedition againſt Italy, he was killed in battle, 228 years before the Chriſtian æra. He left three ſons, whom he had educated, as he ſaid, like three lions, to tear Rome in pieces; and made Hannibal, his eldeſt ſon, ſwear an eternal enmity againſt the Romans.

AMILICTI, in the Chaldaic theology, denote a kind of intellectual powers, or perſons in the divine hierarchy. The amilicti are repreſented as three in number; and conſtitute one of the tryads, in the third order of hierarchy.

AMIRANTE, in the Spaniſh polity, a great officer of ſtate, anſwering to the lord high-admiral in England.

AMISUS, the chief city of the ancient kingdom of Pontus. It was built by the Mileſians, and peopled partly by them, and partly by a colony from Athens. It was at firſt a free city, like the other Greek cities in Aſia; but afterwards ſubdued by Pharnaces king of Pontus, who made it his metropolis. It was taken by Lucullus in the Mithridatic war, who reſtored it to its ancient liberty. Cloſe by Amiſus ſtood another city called *Eupatoria*, from Mithridates Eupator its founder. This city was likewiſe taken by Lucullus, who levelled it with the ground; but it was afterwards rebuilt by Pompey, who united it with Amiſus, giving them the name of *Pompeiopolis*. It was taken during the war between Cæſar and Pompey, by Pharnaces king of Pontus, who put moſt of its inhabitants to the ſword; but Cæſar, having conquered Pharnaces, made it again a free city.

AMITERNUM, a town of the Sabines, in Italy, (Livy, Pliny); now extinct: The ruins are to be ſeen on the level ridge of a mountain, near S. Vittorino, and the ſprings of the Aternus; not far from Aquila, which roſe out of the ruins of Amiternum.

AMITTERE LEGEM TERRÆ, among lawyers, a phraſe importing the loſs of liberty of ſwearing in any court: The puniſhment of a champion overcome or yielding in battle, of jurors found guilty in a writ of attaint, and of a perſon outlawed.

AM-KAS, in hiſtory, a name given to a ſpacious ſaloon in the palace of the Great-Mogul, where he gives audience to his ſubjects, and where he appears on ſolemn feſtivals with extraordinary magnificence. His throne is ſupported by ſix large ſteps of maſſy gold, ſet with rubies, emeralds, and diamonds, eſtimated at 60,000,000l.

AMMA, among eccleſiaſtical writers, a term uſed to denote an abbeſs, or ſpiritual mother.

AMMAN, or AMMANT, in the German or Belgic policy, a judge who has the cogniſance of civil cauſes. —It is alſo uſed among the French for a public notary, or officer who draws up inſtruments and deeds.

AMMANIA: A genus of the monogynia order, belonging to the tetrandria claſs of plants; and in the natural method ranking under the 17th order, *Calycanthemæ*. The characters are: The *calyx* is an oblong, erect, bell-ſhaped perianthium, with eight ſtriæ, quadrangulated, octodentated, and perſiſtent: The *corolla* is either wanting, or it conſiſts of four ovate expanding petals inſerted in the calyx: The *ſtamina* conſiſt of four briſtly filaments the length of the calyx; the antheræ are didymous: The *piſtillum* has a large ovate germen, above; the ſtylus ſimple and very ſhort; the ſtigma headed: The pericarpium is a roundiſh four-celled capſule, covered by the calyx: the ſeeds are numerous and ſmall.—Of this genus there are three ſpecies enumerated; all of them natives of warm climates. They have no beauty or other remarkable property.

AMMI, BISHOP'S WEED: A genus of the digynia order, belonging to the pentandria claſs of plants; and ranking, in the natural method, under the 45th order, *Umbellatæ*. The characters are: Of the *calyx* the univerſal umbel is manifold; the partial one ſhort and crowded; the involucra are pinnatifid, with numerous leaflets: The *corollæ* are radiated, and all hermaphrodite: The *ſtamina* conſiſt of five capillary filaments; the antheræ roundiſh: The *piſtillum* has a germen beneath: the ſtyli are two, and reflected; and the ſtigmata are obtuſe: There is no *pericarpium;* the fruit is roundiſh, poliſhed, ſtriated, ſmall, and partible: The *ſeeds* are two, plano-convex, and ſtriated. Of this there are three

Species. 1. The majus, or common biſhop's-weed, the ſeeds of which are uſed in medicine. The glaucifolium, with all its leaves cut in the ſhape of a ſpear. 3. The copticum, or Egyptian biſhop's-weed.

Culture, &c. The firſt is an annual plant; and therefore is to be propagated by ſeeds ſown in the autumn, in the place where the plants are to remain. They will flower in June, and the ſeeds will ripen in Auguſt. This plant will grow in any open ſituation, but thrives beſt in a light ſandy ſoil. The ſecond ſort is perennial, and very hardy. It thrives beſt in a moiſt ſoil, and may be propagated by ſeeds in the ſame manner as the former.

The third ſpecies is now no otherwiſe known than by the figure of its ſeeds, which were formerly uſed in medicine, but have long ſince given place to thoſe of the common kind. The ſeeds of the ammi-copticum are ſmall, ſtriated, of a reddiſh brown colour, and have a warm pungent taſte, and a pleaſant ſmell approaching to that of origanum. They are recommended as ſtomachic, carminative, and diuretic; but have long been ſtrangers to the ſhops. The ſeeds of the ammi-majus, which are uſed in their place, are much weaker both in taſte and ſmell, and without the origanum flavour of the other.

AMMIANUS (Marcellinus), a Grecian and a ſoldier, as he calls himſelf, was born at Antioch, and flouriſhed under Conſtantius and the preceding emperors as late as Theodoſius. He ſerved under Julian in the eaſt; and wrote in Latin an intereſting hiſtory, from the reign of Nerva to the death of Valens, in 31 books, of which only 18 remain. Though a Pagan, he ſpeaks with candour and moderation of the Chriſtian religion, and even praiſes it: his hero is the emperor Julian. He died about the year 390. The beſt edition of his hiſtory is that of Gronovius, in 1693.

AMMIRATO (Scipio), an eminent Italian hiſtorian, born at Lecca in Naples in 1531. After travelling over great part of Italy, without ſettling to his ſatisfaction, he was engaged by the great duke of Tuſcany to write *The Hiſtory of Florence;* for which he was preſented to a canonry in the cathedral there. He wrote other works while in this ſtation; and died in 1600.

AMMOCHRYSOS, from αμμος, *ſand*, and χρυσος, *gold*, a name given by authors to a ſtone very common in Germany, and ſeeming to be compoſed of a golden ſand. It is of a yellow gold-like colour, and its particles are very gloſſy, being all fragments of a coloured talc. It is uſually ſo ſoft as to be eaſily rubbed to a powder in the hand; ſometimes it requires grinding to powder in a mortar, or otherwiſe. It is uſed only as ſand to ſtrew over writing. The Germans call it *katzengold.* There is another kind of it, leſs common, but much more beautiful, conſiſting of the ſame ſort of gloſſy ſpangles, but thoſe not of a gold colour, but of a bright red, like vermilion.

AMMODYTES, or SAND-EEL, in ichthyology, a genus of fiſhes belonging to the order of apodes. This fiſh reſembles an eel, and ſeldom exceeds a foot in length. The head of the ammodytes is compreſſed, and narrower than the body; the upper jaw is larger than the under; the body is cylindrical, with ſcales hardly perceptible. There is but one ſpecies of the ammodytes, viz. the tobianus, or launce, a native of Europe. This fiſh gathers itſelf into a circle, and pierces the ſand with its head in the centre. It is found in moſt of the ſandy ſhores during ſome of the ſummer-months: it conceals itſelf, on the receſs of the tides, beneath the ſand, in ſuch places where the water is left, at the depth of about a foot; and is in ſome places dug out, in others drawn up by means of a hook contrived for that purpoſe. They are commonly uſed as baits for other fiſh, but they are alſo very delicate eating. Theſe fiſh are found in the ſtomach of the *Porpeſs;* an argument that the laſt roots up the ſand with its noſe, as the hogs do the ground.

AMMON, anciently a city of Marmarica (Ptolemy). Arrian calls it a *place,* not a city, in which ſtood the temple of Jupiter Ammon, round which there was nothing but ſandy waſtes. Pliny ſays, That the oracle of Ammon was 12 days journey from Memphis, and among the *Nomi* of Egypt he reckons the *Nomos Ammoniacus:* Diodorus Siculus, That the diſtrict where the temple ſtood, though ſurrounded with deſarts, was watered by dews which fell nowhere elſe in all that country. It was agreeably adorned with fruitful trees and ſprings, and full of villages. In the middle ſtood the acropolis or citadel, encompaſſed with a triple wall; the firſt and inmoſt of which contained the palace; the others the apartments of the women, the relations and children, as alſo the temple of the god, and the ſacred fountain for luſtrations. Without the acropolis ſtood, at no great diſtance, another temple of Ammon, ſhaded by a number of tall trees: near which there was a fountain, called that of the ſun, or *Solis Fons,* becauſe ſubject to extraordinary changes according to the time of the day; morning and evening warm, at noon cold, at midnight extremely hot. A kind of foſſil ſalt was ſaid to be naturally produced here. It was dug out of the earth in large oblong pieces, ſometimes three fingers in length, and tranſparent as cryſtal. It was thought to be a preſent worthy of kings, and uſed by the Egyptians in their ſacrifices.—From this our ſal-ammoniac has taken its name.

AMMON, or HAMMON, in heathen mythology, the name of the Egyptian Jupiter, worſhipped under the figure of a ram.

Bacchus having ſubdued Aſia, and paſſing with his army through the deſarts of Africa, was in great want of water: but Jupiter, his father, aſſuming the ſhape of a ram, led him to a fountain, where he refreſhed himſelf and his army; in gratitude for which favour, Bacchus built there a temple to Jupiter, under the title of *Ammon,* from the Greek αμμος, which ſignifies *ſand,* alluding to the ſandy deſart where it was built. In this temple was an oracle of great note, which Alexander the Great conſulted, and which laſted till the time of Theodoſius.

Hammon, the god of the Egyptians, was the ſame with the Jupiter of the Greeks; for which reaſon theſe latter denominate the city which the Egyptians call No-Hammon, or the habitation of Ammon, *Dioſpolis,* or the city of Jupiter. He is thought to be the ſame with Ham, who peopled Africa, and was the father of Mizraim, the founder of the Egyptians.

AMMON, or BEN-AMMI, the ſon of Lot, begot by that patriarch upon his youngeſt daughter (Gen. xix. 38.) He was the father of the Ammonites, and dwelt to the eaſt of the Dead Sea, in the mountains of Gilead. See AMMONITIS and AMMONITES.

AMMON (Andreas), an excellent Latin poet, born at Lucca in Italy, was ſent by Pope Leo X. to England, in the characters of prothonotary of the Apoſtolic See, and collector-general of the kingdom. Being a man of ſingular genius and learning, he ſoon became acquainted with the principal literati of thoſe times; particularly with Eraſmus, Colet, Grocin, and others, for the ſake of whoſe company he reſided ſome time at Oxford. The advice which Eraſmus gives him, in regard to puſhing his fortune, has a good deal of humour in it, and was certainly intended as a ſatire on the artful methods generally practiſed by the ſelfiſh and ambitious part of mankind: "In the firſt place (ſays he), throw off all ſenſe of ſhame; thruſt yourſelf into every one's buſineſs, and elbow out whomſoever you can; neither love nor hate any one; meaſure every thing by your own advantage; let this be the ſcope and drift of all your actions. Give nothing but what is to be returned with uſury, and be complaiſant to every body. Have always two ſtrings to your bow. Feign that you are ſolicited by many from abroad, and get every thing ready for your departure. Show letters inviting you elſewhere, with great promiſes." Ammon was Latin ſecretary to Henry VIII. but at what time he was appointed does not appear. In 1512 he was made canon and prebendary of the collegiate chapel of St Stephen, in the palace of Weſtminſter. He was likewiſe

wiſe prebendary of Wells; and in 1514 was preſented to the rectory of Dychial in that dioceſe. About the ſame time, by the king's ſpecial recommendation, he was alſo made prebendary of Saliſbury. He died in the year 1517, and was buried in St Stephen's chapel in the palace of Weſtminſter. He was eſteemed an elegant Latin writer, and an admirable poet. The epiſtles of Eraſmus to Ammon abound with encomiums on his genius and learning.—His works are, 1. *Epiſtolæ ad Eraſmum,* lib. i. 2. *Scotici conflictus hiſtoria,* lib i. 3. *Bucolicæ vel eclogæ,* lib. i. Baſil 1546. 4. *De rebus nihil,* lib. i. 5. *Panegyricus quidam,* lib. i. 6. *Varii generis epigrammata,* lib. i. 7. *Poemata diverſa,* lib. i.

AMMONIAC, a concrete gummy reſinous juice, brought from the Eaſt-Indies, uſually in large maſſes, compoſed of little lumps or tears, of a milky colour, but ſoon changing, upon being expoſed to the air, of a yellowiſh hue. We have no certain account of the plant which affords this juice; the ſeeds uſually found among the tears reſemble thoſe of the umbelliferous claſs. It has been, however, alleged, and not without ſome degree of probability, that it is an exudation from a ſpecies of the FERULA, another ſpecies of which produces the aſſafœtida. The plant producing it is ſaid to grow in Nubia, Abyſſinia, and the interior parts of Egypt. It is brought to the weſtern part of Europe from Egypt, and to England from the Red Sea, by ſome of the ſhips belonging to the Eaſt-India Company trading to thoſe parts. Such tears as are large, dry, free from little ſtones, ſeeds, or other impurities, ſhould be picked out, and preferred for internal uſe: the coarſer kind is purified by ſolution and colature, and then carefully inſpiſſating it; unleſs this be artfully managed, the gum will loſe a conſiderable deal of its more volatile parts. There is often vended in the ſhops, under the name of ſtrained gum-ammoniacum, a compoſition of ingredients much inferior in virtue.

Ammoniac has a nauſeous ſweet taſte, followed by a bitter one; and a peculiar ſmell, ſomewhat like that of galbanum, but more grateful: it ſoftens in the mouth, and grows of a whiter colour upon being chewed. Thrown upon live coals, it burns away in flame: it is in ſome meaſure ſoluble in water and in vinegar, with which it aſſumes the appearance of milk; but the reſinous part, amounting to about one half, ſubſides on ſtanding.

Ammoniac is an uſeful deobſtruent, and frequently preſcribed for opening obſtructions of the abdominal viſcera, and in hyſterical diſorders occaſioned by a deficiency of the menſtrual evacuations. It is likewiſe ſuppoſed to deterge the pulmonary veſſels; and proves of conſiderable ſervice in ſome kinds of aſthmas, where the lungs are oppreſſed by viſcid phlegm: in this intention, a ſolution of gum-ammoniac in vinegar of ſquills proves a medicine of great efficacy, though not a little unpleaſant. In long and obſtinate cholics proceeding from viſcid matter lodged in the inteſtines, this gummy reſin has produced happy effects, after the purges and the common carminatives had been uſed in vain. Ammoniac is moſt commodiouſly taken in the form of pills; about a ſcruple may be given every night, or oftener. Externally, it ſoftens and ripens hard tumours: a ſolution of it in vinegar ſtands recommended by ſome for reſolving even ſchirrhous ſwellings. A plaſter made of it and ſquill-vinegar is recommended by ſome in white ſwellings. A dilute mixture of the ſame is likewiſe rubbed on the parts, which are alſo fumigated with the ſmoke of juniper-berries. In the ſhops is prepared a ſolution of it in pennyroyal water called from its milky colour *lac-ammoniaci.* It is an ingredient alſo in the ſquill pills.

Sal-AMMONIAC, a volatile ſalt, of which there are two kinds, ancient and modern. The ancient ſort, deſcribed by Pliny and Dioſcorides, was a native ſalt, generated in thoſe large inns or caravanſeras where the crowd of pilgrims, coming from the temple of Jupiter Ammon, uſed to lodge; who, in thoſe parts, travelling upon camels, and thoſe creatures when in Cyrene, a province of Egypt, where that celebrated temple ſtood, urining in the ſtables, or (ſay ſome) in the parched ſands, out of this urine, which is remarkably ſtrong, aroſe a kind of ſalt, denominated ſometimes (from the temple) *Ammoniac,* and ſometimes (from the country) *Cyreniac.* Since the ceſſation of theſe pilgrimages, no more of this ſalt is produced there; and, from this deficiency, ſome ſuſpect there never was any ſuch thing: But this ſuſpicion is removed, by the large quantities of a ſalt, nearly of the ſame nature, thrown out by mount Ætna. The characters of the ancient ſal-ammoniac are, that it cools water, turns aqua-fortis into aqua-regia, and conſequently diſſolves gold.

The modern ſal-ammoniac is entirely factitious: for which, ſee CHEMISTRY-*Index.*

AMMONIAN PHILOSOPHY. See AMMONIUS.

AMMONITÆ, in natural hiſtory. See *Cornu Ammonis.*

AMMONITES, a people deſcended from Ammon the ſon of Lot. The Ammonites deſtroyed thoſe giants which they called Zamzummims (Deut. ii. 19—21.), and ſeized upon their country. God forbad Moſes, and by him the children of Iſrael (*id.* 19.), to attack the Ammonites; becauſe he did not intend to give their lands unto the Hebrews. Before the Iſraelites entered the land of Canaan, the Amorites had by conqueſt got great part of the countries belonging to the Ammonites and Moabites. This Moſes retook from the Amorites, and divided between the tribes of Gad and Reuben. In the time of Jephtha, the Ammonites declared war againſt the Iſraelites (Judges xi.), under pretence that they detained a great part of the country which had formerly been theirs before the Amorites poſſeſſed it. Jephtha declared, that as this was an acquiſition which the Iſraelites had made in a juſt war, and what they had taken from the Amorites, who had long enjoyed it by right of conqueſt, he was under no obligation to reſtore it. The Ammonites were not ſatisfied with this reaſon; wherefore Jephtha gave them battle and defeated them. The Ammonites and Moabites generally united whenever there was any deſign ſet a-foot of attacking the Iſraelites. After the death of Othniel (*id.* iii.), the Ammonites and Amalekites joined with Eglon king of Moab to oppreſs the Hebrews; whom they ſubdued, and governed for the ſpace of 18 years, till they were delivered by Ehud the ſon of Gera, who ſlew Eglon king of Moab. Some time after this, the Ammonites made war againſt the Iſraelites, and greatly diſtreſſed them. But theſe were at laſt delivered by the hands of Jephtha; who having attacked the Ammonites, made a very great ſlaughter among them (chap. xi.). In the beginning of Saul's reign (1. Sam. xi.), Naaſh king of the Ammonites having ſat down before Jabeſh-gilead, reduced the inhabitants to the extremity of demanding a capitulation. Naaſh anſwered, that he would capitulate with them upon no other conditions than their ſubmitting every one to have his right eye plucked out, that ſo they might be made a reproach to Iſrael: but Saul coming ſeaſonably to the relief of Jabeſh, delivered the city and people from the barbarity of the king of the Ammonites. David had been the king of Ammon's friend; and, after the death of this prince, he ſent ambaſſadors to make his compliments of condolence to Hanun his ſon and ſucceſſor; who, imagining that David's ambaſſadors were come as ſpies to obſerve his ſtrength, and the condition of his kingdom, treated them in a very injurious manner (2 Sam. x. 4.). David revenged this indignity thrown upon his ambaſſadors, by ſubduing the Ammonites, the Moabites, and the Syrians their allies. Ammon and Moab continued under the obedience of the kings David and Solomon; and, after the ſeparation of the ten tribes, were ſubject to the kings of Iſrael till the death of Ahab in the year of the world 3107. Two years after the death of Ahab, Jehoram his ſon, and ſucceſſor of Ahaziah, defeated the Moabites (2 Kings iii.): but it does not appear that this victory was ſo complete as to reduce them to his obedience. At the ſame time, the Ammonites, Moabites, and other people, made an irruption upon the lands belonging to Judah; but were forced back and routed by Jehoſhaphat (2 Chr. xx. 1, 2.). After the tribes of Reuben, Gad, and the half-tribe of Manaſſeh, were carried into captivity by Tiglath-pileſer in the year 3264, the Ammonites and Moabites took poſſeſſion of the cities belonging to theſe tribes. Jeremiah (xlix. 1.) reproaches them for it. The ambaſſadors of the Ammonites were ſome of thoſe to whom this prophet (chap. xxvii. 2—4.) preſented the cup of the Lord's fury, and directed to make bonds and yokes for themſelves; exhorting them to ſubmit themſelves to Nebuchadnezzar, and threatening them, if they did not, with captivity and ſlavery. Ezekiel (xxv. 4—10.) denounces their entire deſtruction; and tells them that God would give them up to the people of the eaſt, who ſhould ſet their palaces in their country, ſo that there ſhould be no more mention of the Ammonites among the nations. It is believed that theſe misfortunes happened to the Ammonites in the fifth year after the taking of Jeruſalem, when Nebuchadnezzar made war againſt all the people that dwelt upon the confines of Judea, in the year of the world 3420.

It is alſo thought probable, that Cyrus gave the Ammonites and Moabites the liberty of returning into their own country, from whence they had been removed by Nebuchadnezzar: for we ſee them, in the place of their former ſettlement, expoſed to thoſe revolutions which were common to the people of Syria and Paleſtine; ſubjects ſometimes to the kings of Egypt, and at other times to the kings of Syria. We are told by Polybius, that Antiochus the Great took Rabboth, or Philadelphia, their capital, demoliſhed the walls, and put a garriſon in it in 3806. During the perſecutions of Antiochus Epiphanes, Joſephus informs, that the Ammonites ſhowed their hatred to the Jews, and exerciſed great cruelties againſt ſuch of them as lived about their country. Juſtin Martyr ſays, That in his time there were ſtill many Ammonites remaining; but Origen aſſures us, that when he was living they were known only under the general name of Arabians. Thus was the prediction of Ezekiel (xxv. 10) accompliſhed; who ſaid that the Ammonites ſhould be deſtroyed in ſuch a manner as not to be remembered among the nations.

AMMONITIS (anc. geog.), a country of Arabia Petræa, occupied by the children of Ammon, whence the appellation. Its limits, partly to the weſt and partly to the north, were the river Jabbok, whoſe courſe is no where determined; though Joſephus ſays, that it runs between Rabbath-Ammon, or Philadelphia, and Geraſa, and falls into the Jordan.

AMMONIUS, ſirnamed SACCAS, was born in Alexandria, and flouriſhed about the beginning of the third century. He was one of the moſt celebrated philoſophers of his age; and, adopting with alterations the Eclectic philoſophy, laid the foundations of that ſect which was diſtinguiſhed by the name of the *New Platonics*. See ECCLECTICS and PLATONISM.

This learned man was born of Chriſtian parents and educated in their religion; the outward profeſſion of which, it is ſaid, he never entirely deſerted. As his genius was vaſt and comprehenſive, ſo were his projects bold and ſingular: For he attempted a general coalition of all ſects, whether philoſophical or religious, by framing a ſyſtem of doctrines which he imagined calculated to unite them all, the Chriſtians not excepted, in the moſt perfect harmony. In purſuance of this deſign, he maintained, that the great principles of all philoſophical and religious truth were to be found equally in all ſects; that they differed from each other only in their method of expreſſing them, and in ſome opinions of little or no importance; and that, by a proper interpretation of their reſpective ſentiments, they might eaſily be united into one body. Accordingly, all the Gentile religions, and even the Chriſtian, were to be illuſtrated and explained by the principles of this univerſal philoſophy; and the fables of the prieſts were to be removed from Paganiſm, and the comments and interpretations of the diſciples of Jeſus from Chriſtianity. In conformity to this plan, he inſiſted, that all the religious ſyſtems of all nations ſhould be reſtored to their original purity, and reduced to their primitive ſtandard, viz. the ancient philoſophy of the Eaſt, preſerved uncorrupted by Plato: and he affirmed, that this project was agreeable to the intentions of Jeſus Chriſt; whoſe ſole view in deſcending upon earth was to ſet bounds to the reigning ſuperſtition, to remove the errors that had blended themſelves with the religion of all nations, but not to aboliſh the ancient theology from which they were derived. He therefore adopted the doctrines which were received in Egypt concerning the univerſe and the Deity, conſidered as conſtituting one great whole; concerning the eternity of the world, the nature of ſouls, the empire of Providence, and the government of the world by dæmons. He alſo eſtabliſhed a ſyſtem of moral diſcipline; which allowed the people in general to live according to the laws of their country and the dictates of nature; but required the wiſe to exalt

Ammonius || Amol.

their minds by contemplation, and to mortify the body, ſo that they might be capable of enjoying the preſence and aſſiſtance of the dæmons, and of aſcending after death to the preſence of the Supreme Parent. In order to reconcile the popular religions, and particularly the Chriſtian, with this new ſyſtem, he made the whole hiſtory of the Heathen gods an allegory; maintaining that they were only celeſtial miniſters, intitled to an inferior kind of worſhip. And he acknowledged that Jeſus Chriſt was an excellent man, and the friend of God; but alleged that it was not his deſign entirely to aboliſh the worſhip of dæmons, and that his only intention was to purify the ancient religion. This ſyſtem, ſo plauſible in its firſt riſe, but ſo comprehenſive and complying in its progreſs, has been the ſource of innumerable errors and corruptions in the Chriſtian church. At its firſt eſtabliſhment it is ſaid to have had the approbation of Athenagoras, Pantænus, and Clemens the Alexandrian, and of all who had the care of the public ſchool belonging to the Chriſtians at Alexandria. It was afterwards adopted by Longinus the celebrated author of the treatiſe on the Sublime, Plotinus, Herennius, Origen, Porphyry, Jamblichus the diſciple of Porphyry, Sopater, Ediſius, Euſtathius, Maximus of Epheſus, Priſcus, Chryſanthius the maſter of Julian, Julian the Apoſtate, Hierocles, Proclus, and many others, both Pagans and Chriſtians.

The above opinions of Ammonius are collected from the writings and diſputations of his diſciples, the modern Platonics; for he himſelf left nothing in writing behind him; nay, he impoſed a law upon his diſciples not to divulge his doctrines among the multitude; which injunction, however, they made no ſcruple to neglect and violate.

Ammonius, ſurnamed **Lithotome**, a celebrated ſurgeon of Alexandria; ſo called from his inventing the operation of extracting the ſtone from the bladder.

AMMUNITION, a general name for all warlike proviſions; but more particularly powder, ball, &c.

Ammunition, arms, utenſils of war, gun-powder, imported without licence from his Majeſty, are, by the laws of England, forfeited, and triple the value. And again, ſuch licence obtained, except for furniſhing his Majeſty's public ſtores, is to be void, and the offender to incur a premunire, and to be diſabled to hold any office from the crown.

Ammunition Bread, Shoes, &c. ſuch as are ſerved out to the ſoldiers of an army or garriſon.

AMNESTY, in matters of policy, denotes a pardon granted by a prince to his rebellious ſubjects, uſually with ſome exceptions: ſuch was that granted by Charles II. at his reſtoration.—The word is formed from the Greek *αμνηστια*, the name of an edict of this kind publiſhed by Thraſibulus, on his expulſion of the tyrants out of Athens.

AMNIOS, in anatomy, a thin pellucid membrane which ſurrounds the fœtus in the womb. See Foetus.

AMOEBÆUM, in ancient poetry, a kind of poem repreſenting a diſpute between two perſons, who are made to anſwer each other alternately; ſuch are the third and ſeventh of Virgil's eclogues.

AMOL, a town of Aſia, in the country of the Uſbecks, ſeated on the river Gihon. E. Long. 64. 30. N. Lat. 39. 20.

Amomum.

AMOMUM, Ginger: A genus of the monogynia order, belonging to the monandria claſs of plants. The characters are: The *calyx* is an obſcure three-toothed perianthium, above: The *corolla* is monopetalous, the tubus ſhort, the limbus tripartite: The *ſtamina* is an oblong filament, with the antheræ adjoining: The *piſtillum* has a roundiſh germen, beneath; the ſtylus is filiform, the ſtigma obtuſe: The *pericarpium* is leathery, ſubovate, trigonous, trilocular, and three-valved: The *ſeeds* are numerous.—Of this genus there are four

Species. 1. The zingiber, or common ginger, is a native of the Eaſt, and alſo of ſome parts of the Weſt Indies; where it grows naturally without culture. The roots are jointed, and ſpread in the ground: they put out many green reed-like ſtalks in the ſpring, which ariſe to the height of two feet and an half, with narrow leaves. The flower-ſtems ariſe by the ſide of theſe, immediately from the root; theſe are naked; ending with an oblong ſcaly ſpike. From each of theſe ſcales is produced a ſingle blue flower, whoſe petals are but little lower than the ſquamous covering. 2. The zerumbet, or wild ginger, is a native of India. The roots are larger than thoſe of the firſt, but are jointed in the ſame manner. The ſtalks grow from three to near four feet high, with oblong leaves placed alternately. The flower-ſtems ariſe immediately from the root: theſe are terminated by oblong, blunt, ſcaly heads; out of each ſcale is produced a ſingle white flower, whoſe petals extend a conſiderable length beyond the ſcaly covering. 3. The cardamomum, or cardamom, is likewiſe a native of India; but is little known in Europe except by its ſeeds, which are uſed in medicine. Of this there is a variety, with ſmaller fruit, which makes the diſtinction into cardamomum majus and minus. The firſt, when it comes to us, is a dried fruit or pod about an inch long, containing, under a thick ſkin, two rows of ſmall triangular ſeeds of a warm aromatic flavour. The cardamomum minus is a fruit ſcarce half the length of the foregoing, but conſiderably ſtronger both in ſmell and taſte. 4. The grana paradiſi ſpecies is likewiſe a native of the Eaſt Indies. The fruit containing the grains of paradiſe is about the ſize of a fig, divided into three cells, in each of which are contained two roots of ſmall ſeeds like cardamoms. They are ſomewhat more grateful, and conſiderably more pungent, than cardamoms.

Culture. The firſt two ſpecies are tender, and require a warm ſtove to preſerve them. They are eaſily propagated by parting the roots in the ſpring. Theſe ſhould be planted in pots filled with light rich earth, and plunged into a hot-bed of tanner's-bark, where they muſt conſtantly remain. If we may believe the Abbé Raynal, cardamoms propagate themſelves, in thoſe countries where they are natives, without either ſowing or planting. Nothing more is required than, as ſoon as the rainy ſeaſon is over, to ſet fire to the herb which has produced the fruit.

Uſes. The dried roots of the firſt ſpecies are of great uſe in the kitchen, as well as in medicine. They furniſh a conſiderable export from ſome of the American iſlands. The green roots, preſerved as a ſweet-meat, are preferable to every other kind. The Indians mix them with their rice, which is their common food, to correct its natural inſipidity. This ſpice, mixed with others, gives the diſhes ſeaſoned with it a ſtrong taſte, which is extremely diſagreeable to ſtrangers. The Europeans, however, who come into Aſia without fortunes, are obliged to conform to it. The others adopt it out of complaiſance to their wives, who are generally natives of the country.—Ginger is a very uſeful ſpice, in cold flatulent colics, and in laxity and debility of the inteſtines; it does not heat ſo much as thoſe of the pepper kind, but its effects are much more durable. The cardamoms and grains of paradiſe have the ſame medicinal qualities with ginger.—In Jamaica, the common people employ it in baths and fomentations with good ſucceſs, in complaints of the viſcera, in pleuriſies, and in obſtinate and continued fevers.

Amomum Verum, or *True Amomum*, is a round fruit, about the ſize of a middling grape; containing, under a membranous cover, a number of ſmall rough angular ſeeds, of a blackiſh brown colour on the outſide, and whitiſh within: the ſeeds are lodged in three diſtinct cells; thoſe in each cell are joined cloſely together, ſo as that the fruit, upon being opened, appears to contain only three ſeeds. Ten or twelve of theſe fruits grow together in a cluſter; and adhere without any pedicle, to a woody ſtalk about an inch long; each ſingle fruit is ſurrounded by ſix leaves, in form of a cup; and the part of the ſtalk void of fruit is clothed with leafy ſcales.—The huſks, leaves, and ſtems, have a light grateful ſmell, and a moderately warm aromatic taſte: the ſeeds, freed from the huſks, are in both reſpects much ſtronger; their ſmell is quick and penetrating, their taſte pungent, approaching to that of camphor. Notwithſtanding amomum is an elegant aromatic, it has long been a ſtranger to the ſhops.

Amomum Vulgare. See Sison.

AMONTONS (William), an ingenious experimental philoſopher, was born at Paris in 1663. While he was at the grammar-ſchool, he by ſickneſs contracted a deafneſs that almoſt excluded him converſation. In this ſituation, he applied himſelf to mechanics and geometry; and, it is ſaid, refuſed to try any remedy for his diſorder, either becauſe he deemed it incurable, or becauſe it increaſed his attention. He ſtudied the nature of barometers and thermometers with great care; and wrote *Obſervations and Experiments concerning a new Hour-glaſs, and concerning Barometers, Thermometers, and Hygroſcopes*; which, with ſome pieces in the Journal des Sçavans, are all his literary works. When the royal academy was new-regulated in 1699, he was admitted a member; and read his *New Theory of Friction*, in which he happily cleared up an important object in mechanics. He died in 1705.

AMORÆANS, a ſect or order of gemaric doctors, or commentators on the Jeruſalem Talmud. The Amoræans ſucceeded the Miſchnic doctors. They ſubſiſted 250 years; and were ſucceeded by the Seburæans.

AMORGOS, or Amurgus (anc. geog.), now *Morgo*, not far from Naxus to the eaſt, one of the European Sporades; the country of Simonides the Iambic poet. To this iſland criminals were baniſhed. It was famous for a fine flax called *Emorgis*.

AMORITES, a people deſcended from Amorrhæus, according to the Septuagint and Vulgate; Emoræus, according to other expoſitors; Hæmori, according to the Hebrew; or Emorite, according to our verſion of the bible; who was the fourth ſon of Canaan, Gen. x. 16.

The Amorites firſt of all peopled the mountains lying to the weſt of the Dead Sea. They had likewiſe eſtabliſhments to the eaſt of the ſame ſea, between the brooks of Jabbock and Arnon, from whence they forced the Ammonites and Moabites. Numb. xiii. 30. xxi. 29. Joſh. v. 1. and Judges xi. 19, 20. Moſes made a conqueſt of this country from their kings Sihon and Og, in the year of the world 2553.

The prophet Amos (ii. 9.), ſpeaking of the gigantic ſtature and valour of the Amorites, compares their height with that of cedars, and their ſtrength with that of an oak. The name Amorite is often taken in Scripture for all Canaanites in general. The lands which the Amorites poſſeſſed on this ſide Jordan were given to the tribe of Judah, and thoſe which they had enjoyed beyond this river were diſtributed between the tribes of Reuben and Gad.

AMORIUM, a town of Phrygia Major, near the river Sangarius, on the borders of Galatia.—It was taken from the Romans by the Saracens in 668; but ſoon after retaken by the Romans.—A war breaking out again between theſe two nations in 837, the Roman emperor Theophylus deſtroyed Sozopetra the birth-place of the khalif Al' Motaſem, notwithſtanding his earneſt intreaties to him to ſpare it. This ſo enraged the khalif, that he ordered every one to engrave upon his ſhield the word *Amorium*, the birth-place of Theophylus, which he reſolved at all events to deſtroy. Accordingly he laid ſiege to the place, but met with a vigorous reſiſtance. At length, after a ſiege of 55 days, it was betrayed by one of the inhabitants who had abjured the Chriſtian religion. The khalif, exaſperated at the loſs he had ſuſtained during the ſiege, put moſt of the men to the ſword, carried the women and children into captivity, and levelled the city with the ground. His forces being diſtreſſed for want of water on their return home, the Chriſtian priſoners roſe upon ſome of them, and murdered them; upon which the khalif put 6000 of the priſoners to death.—According to the eaſtern hiſtorians, 30,000 of the inhabitants of Amorium were ſlain, and as many carried into captivity.

AMORPHA, False Indigo: A genus of the decandria order, belonging to the diadelphia claſs of plants; and in the natural method ranking under the 32d order, *Papilionaceæ*. The characters are: The *calyx* is a ſingle-leaved perianthium, tubular and perſiſtent: The *corolla* conſiſts of an ovate, concave, erect petal, ſcarcely larger than, and placed on the upper ſide of, the calyx: The *ſtamina* conſiſt of ten erect unequal filaments, longer than the corolla; the antheræ are ſimple: The *piſtillum* has a roundiſh germen; the ſtylus ſubulated, and the length of the ſtamina; the ſtigma ſimple: The *pericarpium* is a lunated unilocular legumen, reflected, larger than the calyx, and tuberculated: The *ſeeds* are two, and kidney-ſhaped. By the corolla alone this genus may be diſtinguiſhed from all the known plants in the univerſe: The petals are the banner; the wings and keel are wanting, which is very ſingular in a papilionaceous corolla.

Of this there is only one known ſpecies, a native of Carolina, where the inhabitants formerly made from it a coarſe kind of indigo, whence the plant took its name. It riſes, with many irregular ſtems, to the height of 12 or 14 feet. The leaves are late in the ſpring before their foliage is fully diſplayed. The ends of their branches are generally deſtroyed by the froſt; or, if they recover it, they have the appearance of being dead; whilſt other plants teſtify their effects of the reviving months. But, notwithſtanding theſe defects, this tree has ſome other good properties that in part make amends for them. The leaves, when out, are admired by all. They are of a pleaſant green colour; are very large, beautifully pinnated, the folioles being arranged along the ſtalk by pairs, and terminate by an odd one. The flowers are of a purple colour; they grow in ſpikes, ſeven or eight inches long, at the ends of the branches, and are of a ſingular ſtructure. In order to make this tree have its beſt effect, it ſhould be planted among others of its own growth, in a well-ſheltered ſituation; by which means the ends will not be ſo liable to be deſtroyed by the winter's froſts; the branches will not ſuffer by the violence of the winds; and, as it is ſubject to put out many branches near the root, theſe indelicacies and imperfections will be concealed; whilſt the tree will ſhow itſelf to the utmoſt advantage when in blow, by elevating its purple-ſpiked flowers amongſt the others in a pleaſing view.

Culture. The amorpha is moſt readily propagated by ſeeds. It may alſo be propagated by laying down the young branches, which in one year will make good roots; and may then be taken off, and planted either in the nurſery, or in the places where they are deſigned to remain. If they are put into a nurſery, they ſhould not remain there more than one year; for as the plants make large ſhoots, they do not remove well when they have remained long in a place.

AMORTIZATION, in law, the alienation of lands or tenements to a corporation or fraternity, and their ſucceſſors. See Mortmain.

AMOS, the fourth of the ſmall prophets, who in his youth had been a herdſman in Tekoa, a ſmall town about four leagues ſouthward of Jeruſalem, was ſent to the kine of Baſhan, that is, to the people of Samaria, or the kingdom of Iſrael, to bring them back to repentance, and an amendment of their lives; whence it is thought probable that he was born within the territories of Iſrael, and only retired to Tekoa on his being driven from Bethel, by Amaziah the prieſt of the golden calves at Bethel.

The prophet being thus retired to Tekoa, in the kingdom of Judah, continued to propheſy. He complains in many places of the violence offered him, by endeavouring to oblige him to ſilence. He boldly remonſtrates againſt the crying ſins that prevailed among the Iſraelites, as idolatry, oppreſſion, wantonneſs, and obſtinacy. He likewiſe reproves thoſe of Judah, ſuch as their carnal ſecurity, ſenſuality, and injuſtice. He terrifies them both with frequent threatenings, and pronounces that their ſins will at laſt end in the ruin of Judah and Iſrael, which he illuſtrates by the viſions of a plumb-line and a baſket of ſummer-fruit. It is obſervable in this prophecy, that as it begins with denunciations of judgment and deſtruction againſt the Syrians, Philiſtines, Tyrians, and other enemies of the Jews, ſo it concludes with comfortable promiſes of reſtoring the tabernacle of David, and erecting the kingdom of Chriſt. Amos was choſen to the prophetic office in the time of Uzziah king of Judah, and Jeroboam the ſon of Joaſh, king of Iſrael, two years before the earthquake (Amos i. 1.), which happened in the 24th or 25th year of Uzziah, according to the rabbins and moſt of the modern commentators; or the year of the world 3219, when this prince uſurped the prieſt's office, and attempted to offer incenſe to the Lord: but it is obſerved, that this cannot be the caſe, becauſe Jotham, the ſon of Uzziah, who was born in 3221, was of age to govern, and conſequently was between 15 and 20 years of age, when his father undertook to offer incenſe, and was ſtruck with a leproſy. The firſt of the prophecies of Amos, in order of time, are thoſe of the 7th chapter: the reſt he pronounced in the town of Tekoa, whither he retired. He foretold the misfortunes which the kingdom of Iſrael ſhould fall into after the death of Jeroboam II. who was then living; he foretold the death of Zechariah, the invaſion of the lands belonging to Iſrael by Phul and Tiglath-pileſer kings of Aſſyria; and he ſpeaks of the captivity of the ten tribes, and their return.

The time and manner of this prophet's death are not known. Some old authors relate that Amaziah, prieſt of Bethel, provoked by the diſcourſes of the prophet, had his teeth broke in order to ſilence him. Others ſay, that Hoſea or Uzziah, the ſon of Amaziah, ſtruck him with a ſtake upon the temples, knocked him down, and wounded him much; in which condition he was carried to Tekoa, where he died, and was buried with his fathers; but it is generally thought that he propheſied a long time at Tekoa, after the adventure which he had with Amaziah; and the prophet himſelf taking no notice of the ill treatment which he is ſaid to have received, is an argument that he did not ſuffer in the manner they relate.

St Jerom obſerves, that there is nothing great or ſublime in the ſtyle of Amos. He applies the words of St Paul (2 Cor. xi. 6.) to him, 'rude in ſpeech though not in knowledge.' And he farther obſerves, that he borrows his compariſon from the ſtate and profeſſion to which he belonged.

AMOY, an iſland in the province of Fokien, in China, Long. 136. 0. Lat. 24. 30. It has a fine port that will contain many thouſand veſſels. The emperor has a garriſon here of 7000 men.

AMPELIS, the vine, in botany. See Vitis.

Ampelis, the *Chatterer*, in zoology, a genus of birds belonging to the order of paſſeres; the diſtinguiſhing characters of which are, that the tongue is furniſhed with a rim or margin all round, and the bill is conical and ſtrait. There are ſeven ſpecies, all natives of foreign countries, except the garrulus, which is a native both of Europe and the Weſt Indies. In the former, the native country of theſe birds is Bohemia; from whence they wander over the reſt of Europe, and were once ſuperſtitiouſly conſidered as preſages of a peſtilence. They appear annually about Edinburgh in February; and feed on the berries of the mountain-aſh. They alſo appear as far ſouth as Northumberland; and, like the field-fare, make the berries of the white-thorn their food. It is but by accident that they ever appear farther ſouth. They are gregarious; feed on grapes, where vineyards are cultivated; are eaſily tamed; and are eſteemed delicious food. This ſpecies is about the ſize of the black-bird: the bill is ſhort, thick, and black; on the head is a ſharp pointed creſt reclining backwards: the lower part of the tail is black; the end of a rich yellow: the quill-feathers are black, the three firſt tipt with white; the ſix next have half an inch of their exterior margin edged with fine yellow, the interior with white. But what diſtinguiſhes this from all other birds, are the horny appendages from the tips of ſeven of the ſecondary feathers, of the colour and gloſs of the beſt red wax.

AMPELITES, CANNEL-COAL, or CANDLE-COAL, a hard, opaque, foſſile, inflammable ſubſtance, of a black colour. It does not effervesce with acids. The ampelites, though much inferior to jet in many reſpects, is yet a very beautiful foſſile; and, for a body of ſo compact a ſtructure, remarkably light. Examined by the microſcope, it appears compoſed of innumerable very ſmall and thin plates, laid cloſely and firmly on one another; and full of very ſmall ſpecks of a blacker and more ſhining matter than the reſt, which is evidently a purer bitumen than the general maſs. Theſe ſpecks are equally diffuſed over the different parts of the maſſes. There is a large quarry of it near Alençon in France. It is dug in many parts of England, but the fineſt is in Lancaſhire and Cheſhire; it lies uſually at conſiderable depths. It makes a very briſk fire, flaming violently for a ſhort time, and after that continuing red and glowing hot a long while; and finally is reduced into a ſmall proportion of grey aſhes, the greater part of its ſubſtance having flown off in the burning.—It is capable of a very high and elegant poliſh; and, in the countries where it is produced, is turned into a vaſt number of toys, as ſnuff-boxes and the like, which bear all the nicety of turning, and are made to paſs for jet.—Huſbandmen ſmear their vines with it, as it kills the vermin which infeſts them. It is likewiſe uſed for the dyeing of hair black. In medicine it is reputed good in colics, againſt worms, and of being in general an emollient and diſcutient; but the preſent practice takes no notice of it.

AMPELUSIA, (anc. geog.) a promontory of Mauritania Tingitana, called *Cottes* by the natives, which is of the ſame ſignification with a town of the ſame name not far from the river Lixus, near the ſtraits of Gibraltar: now *Cape-Spartel*. W. Long. 6. 30. N. Lat. 36. 0.

AMPHERES, in antiquity, a kind of veſſels wherein the rowers plied two oars at the ſame time, one with the right hand the other with the left.

AMPHIATHROSIS, in anatomy, a term for ſuch junctures of bones as have an evident motion, but different from the diathroſis, &c. See DIATHROSIS.

AMPHIARAUS, in pagan mythology, a celebrated prophet, who poſſeſſed part of the kingdom of Argos. He was believed to excel in divining by dreams, and is ſaid to be the firſt who divined by fire. Amphiaraus knowing, by the ſpirit of prophecy, that he ſhould loſe his life in the war againſt Thebes, hid himſelf in order to avoid engaging in that expedition: but, his wife Eriphyle, being prevailed upon by a preſent, diſcovered the place in which he had concealed himſelf; ſo that he was obliged to accompany the other princes who marched againſt Thebes. This proved fatal to him; for the earth being ſplit aſunder by a thunder-bolt, both he and his chariot were ſwallowed up in the opening.—Amphiaraus, after his death, was ranked among the gods; temples were dedicated to him; and his oracle, as well as the ſports inſtituted to his honour, were very famous.

AMPHIBIA, in zoology, the name of Linnæus's third claſs of animals; including all thoſe which live partly in water and partly on land. This claſs he ſubdivides into four orders, *viz.* The amphibia reptiles; the amphibia ſerpentes; the amphibia nantes; and the amphibia meantes. See ZOOLOGY.

It has been a queſtion whether the animals commonly called *amphibious*, live moſt in the water or on land. If we conſider the words *αμφι* (*utrinque*, both ways), and *βιος* (*vita* life), from whence the term *amphibious* is derived; we ſhould underſtand, that animals, having this title, ſhould be capable of living as well by land, or in the air, as by water; or of dwelling in either conſtantly at will: but it will be difficult to find any animal that can fulfil this definition, as being equally qualified for either. An ingenious naturaliſt*, therefore, from conſidering their œconomy reſpectively, divides them into two orders, *viz.* 1. Such as enjoy their chief functions by land, but occaſionally go into the water. 2. Such as chiefly inhabit the water, but occaſionally go aſhore. What he advances on this ſubject is curious, and well illuſtrates the nature of this claſs.

1. Of the firſt order, he particularly conſiders the phocæ; and endeavours to ſhow, that none of them can live chiefly in the water, but that their chief enjoyment of the functions of life is on ſhore.

Theſe animals (he obſerves) are really quadrupeds†; but as their chief food is fiſh, they are under a neceſſity of going out to ſea to hunt their prey, and to great diſtances from ſhore; taking care that, however great the diſtance, rocks or ſmall iſlands are at hand, as reſting-places when they are tired, or when their bodies become too much macerated in the water; and they return to the places of their uſual reſort to ſleep, copulate, and bring forth their young, for the following reaſons, viz. It is well known, that the only eſſential difference (as to the general ſtructure of the heart) between amphibious and mere land animals, or ſuch as never go into the water, is, that in the former, the oval hole remains always open. Now, in ſuch as are without this hole, if they are to be immerſed in water for but a little time, reſpiration would ceaſe, and the animal muſt die; becauſe a great part of the maſs of blood paſſes from the heart by the pulmonary artery through the lungs, and by the pulmonary veins returns to the heart, while the aorta is carrying the greater part of the maſs to the head and extremities, &c.

Now, the blood paſſes through the lungs in a continual uninterrupted ſtream, while reſpiration is gentle and moderate: but when it is violent, then the circulation is interrupted, for inſpiration and exſpiration are now carried to their extent; and in this ſtate the blood cannot paſs through the lungs either during the total inſpiration or total exſpiration of the air in breathing: for, in the former caſe, the inflation compreſſes the returning veins; and, in the latter, by the collapſion of the lungs, theſe veins are interrupted alſo; ſo that it is only between theſe two violent actions that the blood can paſs: and hence it is, that the lives of animals are ſhortened and their health impaired, when they are ſubjected to frequent violent reſpiration; and thus it is, that when animals have once breathed, they muſt con-

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* Dr *Parſon's*; in a paper read before the Royal Society.

† See the article *Phoca*.

tinue to reſpire ever after, for life is at an end when that ceaſes.

There are three neceſſary and principal uſes of reſpiration in all land-animals, and in thoſe kinds that are counted amphibious.—The firſt is that of promoting the circulation of the blood through the whole body and extremities. In real fiſhes, the force of the heart is alone capable of ſending the blood to every part, as they are not furniſhed with limbs or extremities; but in the others mentioned, being all furniſhed with extremities, reſpiration is an aſſiſtant force to the arteries in ſending blood to the extremities; which, being ſo remote from the heart, have need of ſuch aſſiſtance, otherwiſe the circulation would be very languid in theſe parts: thus we ſee, that in perſons ſubject to aſthmatic complaints, the circulation grows languid, the legs grow cold and oedematous, and other parts ſuffer by the defect in reſpiration.—A ſecond uſe of breathing is, that, in inſpiration, the variety of particles, of different qualities, which float always in the air, might be drawn into the lungs, to be inſinuated into the maſs of blood, being highly neceſſary to contemperate and cool the agitated maſs, and to contribute refined pabulum to the finer parts of it, which, meeting with the daily ſupply of chyle, ſerves to aſſimilate and more intimately mix the maſs, and render its conſtitution the fitter for ſupporting the life of the animal. Therefore it is, that valetudinarians, by changing foul or unwholeſome air, for a free, good, open air, often recover from lingering diſeaſes.—A third principal uſe of reſpiration is, to promote the exhibition of voice in animals; which all thoſe that live on the land do according to their ſpecific natures.

From theſe conſiderations it appears, that the phocæ of every kind are under an abſolute neceſſity of making the land their principal reſidence. But there is another very convincing argument why they reſide on ſhore the greateſt part of their time; namely, that the fleſh of theſe creatures is analagous to that of other land animals: and therefore, by over-long maceration, added to the fatigue of their chacing their prey, they would ſuffer ſuch a relaxation as would deſtroy them. It is well known, that animals which have lain long under water, are reduced to a very lax and even putrid ſtate; and the phoca muſt baſk in the air on ſhore: for while the ſolids are at reſt, they acquire their former degree of tenſion, and the vigour of the animal is reſtored; and while he has an uninterrupted placid reſpiration, his blood is refreſhed by the new ſupply of air, as explained above, and he is rendered fit for his next cruiſe: for action waſtes the moſt exalted fluids of the body, more or leſs, according to its duration and violence; and the reſtorative reſt muſt continue a longer or ſhorter time, according to the quantity of the previous fatigue.

Let us now examine by what power theſe animals are capable of remaining longer under water than land-animals.

All theſe have the oval hole open between the right and left auricles of the heart; and, in many, the canalis arterioſus alſo: and while the phoca remains under water, which he may continue an hour or two more or leſs, his reſpiration is ſtopped; and the blood, not finding the paſſage through the pulmonary artery free, ruſhes through the hole from the right to the left auricle, and partly through the arterial canal, being a ſhort paſſage to the aorta, and thence to every part of the body, maintaining the circulation: but, upon riſing to come aſhore, the blood finds its paſſage again thro' the lungs the moment he reſpires.

Thus the fœtus in utero, during its confinement, having the lungs compreſſed, and conſequently the pulmonary arteries and veins impervious, has the circulation of the blood carried on through the oval hole and the arterial canal. Now, ſo far the phoca in the water, and the fœtus in utero, are analogous; but they differ in other material circumſtances. One is, that the fœtus having never reſpired, remains ſufficiently nouriſhed by the material blood circulating through him, and continues to grow till the time of his birth, without any want of reſpiration during nine months confinement: the phoca, having reſpired the moment of his birth, cannot live very long without it, for the reaſons given before; and this hole and canal would be cloſed in them, as it is in land-animals, if the dam did not, ſoon after the birth of the cub, carry him ſo very frequently into the water to teach him; by which practice theſe paſſages are kept open during life, otherwiſe they would not be capable of attaining the food deſigned for them by Providence.

Another difference is, that the phoca, as was ſaid before, would be relaxed by maceration in remaining too long in the water; whereas the fœtus in utero ſuffers no injury from continuing its full number of months in the fluid it ſwims in: the reaſon is, that water is a powerful ſolvent, and penetrates the pores of the ſkins of land-animals, and in time can diſſolve them; whereas the *liquor amnii* is an inſipid ſoft fluid, impregnated with particles more or leſs mucilaginous, and utterly incapable of making the leaſt alteration in the cutis of the fœtus.

Otters, beavers, and ſome kinds of rats, go occaſionally into the water for their prey, but cannot remain very long under water. "I have often gone to ſhoot otters (ſays our author), and watched all their motions: I have ſeen one of them go ſoftly from a bank into the river, and dive down; and in about two minutes riſe, at 10 or 15 yards from the place he went in, with a middling ſalmon in his mouth, which he brought on ſhore: I ſhot him, and ſaved the fiſh whole." Now, as all fœtuſes have theſe paſſages open, if a whelp of a true water-ſpaniel was, immediately after its birth, ſerved as the phoca does her cubs, and immerſed in water, to ſtop reſpiration for a little time every day, it is probable that the hole and canal would be kept open, and the dog be made capable of remaining as long under water as the phoca.

Frogs, how capable ſoever of remaining in the water, yet cannot avoid living on land, for they reſpire; and if a frog be thrown into a river, he makes to the ſhore as faſt as he can.

The lizard kind, ſuch as may be called water-lizards (ſee LACERTA), are all obliged to come to land, in order to depoſite their eggs, to reſt, and to ſleep. Even the crocodiles, who dwell much in rivers, ſleep and lay their eggs on ſhore; and, while in the water, are compelled to riſe to the ſurface to breathe; yet, from the texture of his ſcaly covering, he is capable of remaining in the water longer by far than any ſpecies of the phoca, whoſe ſkin is analogous to that of a horſe or cow.

The hippopotamus (See HIPPOPOTAMUS), who wades into the lakes or rivers, is a quadruped, and remains under the water a conſiderable time; yet his chief reſidence is upon land, and he muſt come on ſhore for reſpiration.

The teſtudo, or ſea tortoiſe (ſee TESTUDO), though he goes out to ſea, and is often found far from land; yet, being a reſpiring animal, cannot remain long under water. He has indeed a power of rendering himſelf ſpecifically heavier or lighter than the water, and therefore can let himſelf down to avoid an enemy or a ſtorm: yet he is under a neceſſity of riſing frequently to breathe, for reaſons given before; and his moſt uſual ſituation, while at ſea, is upon the ſurface of the water, feeding upon the various ſubſtances that float in great abundance every where about him; theſe animals ſleep ſecurely upon the ſurface, but not under water; and can remain longer at ſea than any other of this claſs, except the crocodile, becauſe, as it is with the latter, his covering is not in danger of being too much macerated; yet they muſt go on ſhore to copulate and lay their eggs.

2. The conſideration of theſe is ſufficient to inform us of the nature of the firſt order of the claſs of amphibious animals; let us now ſee what is to be ſaid of the ſecond in our diviſion of them, which are ſuch as chiefly inhabit the waters, but occaſionally go on ſhore.

Theſe are but of two kinds: the eels, and water ſerpents or ſnakes of every kind. It is their form that qualifies them for loco-motion on land, and they know their way back to the water at will; for by their ſtructure they have a ſtrong periſtaltic motion, by which they can go forward at a pretty good rate: whereas all other kinds of fiſh, whether vertical or horizontal, are incapable of a voluntary loco-motion on ſhore; and therefore, as ſoon as ſuch fiſh are brought out of the water, after having flounced a while, they lie motionleſs, and ſoon die.

Let us now examine into the reaſon why theſe vermicular fiſh, the eel and ſerpent kinds, can live a conſiderable time on land, and the vertical and horizontal kinds die almoſt immediately when taken out of the water: and, in this reſearch, we ſhall come to know what analogy there is between land animals and thoſe of the waters. All land-animals have lungs, and can live no longer than while theſe are inflated by the ambient air, and alternately compreſſed for its expulſion; that is, while reſpiration is duly carried on, by a regular inſpiration and exſpiration of air.

In like manner, the fiſh in general have, inſtead of lungs, gills or branchiæ: and as in land-animals the lungs have a large portion of the maſs of blood circulating through them, which muſt be ſtopped if the air has not a free ingreſs and egreſs into and from them; ſo, in fiſh, there is a great number of blood-veſſels that paſs through the branchiæ, and a great portion of their blood circulates through them, which muſt in like manner be totally ſtopped, if the branchiæ are not perpetually wet with water. So that, as the air is to the lungs in land-animals a conſtant aſſiſtant to the circulation; ſo is the water to the branchiæ of thoſe of the rivers and ſeas: for when theſe are out of the water, the branchiæ very ſoon grow criſp and dry, the blood-veſſels are ſhrunk, and the blood is obſtructed in its paſſage; ſo, when the former are immerſed in water, or otherwiſe prevented from having reſpiration, the circulation ceaſes and the animal dies.

Again, as land-animals would be deſtroyed by too much maceration in water; ſo fiſhes would, on the other hand, be ruined by too much exſiccation; the latter being, from their general ſtructure and conſtitution, made fit to bear, and live in, the water; the former, by their conſtitution and form, to breathe and dwell in the air.

But it may be aſked, why eels and water-ſnakes are capable of living longer in the air than the other kinds of fiſh? This is anſwered, by conſidering the providential care of the great Creator for theſe and every one of his creatures: for ſince they were capable of loco-motion by their form, which they need not be if they were never to go on ſhore, it ſeemed neceſſary that they ſhould be rendered capable of living a conſiderable time on ſhore, otherwiſe their loco-motion would be in vain. How is this provided for? Why, in a moſt convenient manner: for this order of fiſhes have their branchiæ well covered from the external drying air; they are alſo furniſhed with a ſlimy mucus, which hinders their becoming criſp and dry for many hours; and their very ſkins always emit a mucous liquor, which keeps them ſupple and moiſt for a long time: whereas the branchiæ of other kinds of fiſh are much expoſed to the air, and want the ſlimy matter to keep them moiſt. Now, if any of theſe, when brought out of the water, were laid in a veſſel without water, they might be preſerved alive a conſiderable time, by only keeping the gills and ſurface of the ſkin conſtantly wet, even without any water to ſwim in.

IT has been advanced, that *man* may, by art, be rendered amphibious, and able to live under water as well as frogs. As the fœtus lives *in utero* without air, and the circulation is there continued by means of the foramen ovale; by preſerving the paſſage open, and the other parts *in ſtatu quo*, after the birth, the ſame faculty would ſtill continue. Now, the foramen, it is alledged, would be preſerved in its open ſtate, were people accuſtomed, from their infancy, to hold their breath a conſiderable time once a-day, that the blood might be forced to reſume its priſtine paſſage, and prevent its drying up as it uſually does. This conjecture ſeems, in ſome meaſure, ſupported by the practice of divers, who are taught from their childhood to hold their breath, and keep long under water, by which means the ancient channel is kept open.—A Calabrian monk at Madrid laid claim to this amphibious capacity, making an offer to the king of Spain, to continue twice twenty-four hours under water, without ever coming up to take breath. Kircher gives an account of a Sicilian, named the *fiſh Colas*, who, by a long habitude from his youth, had ſo accuſtomed himſelf to live in water, that his nature ſeemed to be quite altered; ſo that he lived rather after the manner of a fiſh than a man.

AMPHIBOLOGY, in grammar and rhetoric, a term uſed to denote a phraſe ſuſceptible of two different interpretations. Amphibology ariſes from the order of the phraſe, rather than from the ambiguous meaning of a word.

Of this kind was that anſwer which Pyrrhus received from the oracle: *Aio te, Æacida, Romanos vincere poſſe;* where the amphibology conſiſts in this, that the words *te* and *Romanos*, may either of them precede, or either of them follow, the words *poſſe vincere*, indifferently. See Oracle.

The Engliſh language uſually ſpeaks in a more natural manner, and is not capable of any amphibologies of this kind: nor is it ſo liable to amphibologies in the articles, as the French and moſt other modern tongues.

AMPHIBRACHYS, in ancient poetry, the name of a foot conſiſting of three ſyllables, whereof that in the middle is long, and the other two ſhort; ſuch is the word [ăbīrĕ].

AMPHICOME, in natural hiſtory, a kind of figured ſtone, of a round ſhape, but rugged, and beſet with eminences, celebrated on account of its uſe in divination. The word is originally Greek, αμφικομη, *q. d. utrinque comata*, or "hairy on all ſides." This ſtone is alſo called *Erotylos*, Ερωτυλος, *Amatoria*, probably on account of its ſuppoſed power of creating love. The amphicome is mentioned by Democritus and Pliny, though little known among the moderns. Mercatus takes it for the ſame with the *lapis lumbricatus*, of which he gives a figure.

AMPHICTYONS, in Grecian antiquity, an aſſembly compoſed of deputies from the different ſtates of Greece: and reſembling, in ſome meaſure, the diet of the German empire.—Some ſuppoſe the word Αμφικτιονες to be formed of αμφι, "about," and κτιειν or κτιζειν, in regard the inhabitants of the country round about met here in council: others, with more probability, from *Amphictyon*, ſon of Deucalion, whom they ſuppoſe to have been the founder of this aſſembly; though others will have Acriſius, king of the Argives, to have been the firſt who gave a form and laws to it.

Authors give different accounts of the number of the Amphictyons, as well as of the ſtates who were entitled to have their repreſentatives in this council. According to Strabo, Harpocration, and Suidas, they were twelve from their firſt inſtitution, ſent by the following cities and ſtates; the Ionians, Dorians, Perrhæbians, Bœotians, Magneſians, Achæans, Phthians, Melians, Dolopians, Ænianians, Delphians, and Phocians. Æſchines reckons no more than eleven; inſtead of the Achæans, Ænianians, Delphians, and Dolopians, he only gives the Theſſalians, Oetians, and Locrians. Laſtly, Pauſanias's liſt contains only ten, viz. the Ionians, Dolopians, Theſſalians, Ænianians, Magneſians, Melians, Phthians, Dorians, Phſcians, and Locrians.

In the time of Philip of Macedon, the Phocians were excluded the alliance, for having plundered the Delphian temple, and the Lacedæmonians were admitted in their place; but the Phocians, 60 years after, having behaved gallantly againſt Brennus and his Gauls, were reſtored to their ſeat in the Amphictyonic council. Under Auguſtus, the city of Nicopolis was admitted into the body; and to make room for it, the Magneſians, Melians, Phthians, and Ænianians, who till then had diſtinct voices, were ordered to be numbered with the Theſſalians, and to have only one common repreſentative. Strabo ſpeaks as if this council were extinct in the times of Auguſtus and Tiberius: but Pauſanias, who lived many years after, under Antoninus Pius, aſſures us it remained entire in his time, and that the number of Amphictyons was then 30.

The members were of two kinds. Each city ſent two deputies, under different denominations; one called ʼΙερομνημον, whoſe buſineſs ſeems to have been more immediately to inſpect what related to ſacrifices and ceremonies of religion; the other Πυλαγορας, charged with hearing and deciding of cauſes and differences between private perſons. Both had an equal right to deliberate and vote, in all that related to the common intereſts of Greece. The *hieromnemon* was elected by lot; the *pylagoras* by plurality of voices.

Though the Amphictyons were firſt inſtituted at Thermopylæ, M. de Valois maintains, that their firſt place of reſidence was at Delphi; where, for ſome ages, the tranquillity of the times found them no other employment than that of being, if we may ſo call it, church-wardens of the temple of Apollo. In after-times, the approach of armies frequently drove them to Thermopylæ, where they took their ſtation, to be nearer at hand to oppoſe the enemies progreſs, and order timely ſuccour to the cities in danger. Their ordinary reſidence, however, was at Delphi.

Here they decided all public differences and diſputes between any of the cities of Greece; but before they entered on buſineſs, they jointly ſacrificed an ox cut into ſmall pieces, as a ſymbol of their union. Their determinations were received with the greateſt veneration, and even held ſacred and inviolable.

The Amphictyons, at their admiſſion, took a ſolemn oath never to diveſt any city of their right of deputation; never to avert its running waters; and if any attempts of this kind were made by others, to make mortal war againſt them: more particularly, in caſe of any attempt to rob the temple of any of its ornaments, that they would employ hands, feet, tongue, their whole power, to revenge it.—This oath was backed with terrible imprecations againſt ſuch as ſhould violate it; *e.g.* May they meet all the vengeance of Apollo, Diana, Minerva, &c. their ſoil produce no fruit, their wives bring forth nothing but monſters, &c.

The ſtated terms of their meeting was in ſpring and autumn; the ſpring meeting was called Εαρινη Πυλαια, that in autumn Μετοπωρινη. On extraordinary occaſions, however, they met at any time of the year, or even continued ſitting all the year round.

Philip of Macedon uſurped the right of preſiding in the aſſembly of the Amphictyons, and of firſt conſulting the oracle which was called Προμαντεια.

AMPHIDROMIA, a feaſt celebrated by the ancients on the fifth day after the birth of a child.

AMPHIDRYON, in eccleſiaſtical writers, denotes the veil or curtain which was drawn before the door of the bema in ancient churches.

AMPHILOCHIA (anc. geog.), the territory of the city of Argos in Acarnania; *Amphilochium*, (Thucydydes); called *Amphilochi* (from the people,) in the lower age, (Stephanus.) A town alſo of Spain, in Gallicia, built by Teucer, and denominated from Amphilochus one of his companions, (Strabo): now *Orenſe*. W. Long. 8. 20. Lat. 42. 36.

AMPHILOCHIUS, biſhop of Iconium, in the fourth century, was the friend of St Gregory Nazianzen, and St Baſil. He aſſiſted at the firſt general council of Conſtantinople in 381; preſided at the council of Sidæ; and was a ſtrenuous oppoſer of the Arians. He died in 394, and his works were publiſhed in Greek and Latin at Paris 1644, by Francis Combeſis.

AMPHILOCHUS, ſon of Amphiaraus and Eriphyle, was a celebrated diviner. He had an altar erected to him at Athens, and an oracle at Mallus in Cilicia, which city was founded by him and Mopſus. The anſwers of this oracle were given by dreams; the party inquiring uſed to paſs a night in the temple, and that night's dream was the anſwer. Dion Caſſius mentions a picture done by order of Sextus Condianus, repreſenting the anſwer he received of the oracle, in the reign of the emperor Commodus.

AMPHIMACER, in ancient poetry, a foot conſiſting of three ſyllables, whereof the firſt and laſt are long, and that in the middle ſhort; ſuch is the word [Cāſtĭtās.]

AMPHION, ſon of Jupiter and Antiope; who, according to the poets, made the rocks follow his muſic; and at his harp the ſtones of Thebes danced into walls and a regular city.

AMPHIPOLES, in antiquity, the principal magiſtrates of Syracuſe. They were eſtabliſhed by Timoleon in the 109th Olympiad, after the expulſion of the tyrant Dionyſius. They governed Syracuſe for the ſpace of 300 years: and Diodorus Siculus aſſures us, that they ſubſiſted in his time.

AMPHIPOLIS, a city of Macedonia, an Athenian colony, on the Strymon, but on which ſide is not ſo certain: Pliny places it in Macedonia, on this ſide; but Scylax, in Thrace, on the other. The name of the town, *Amphipolis*, however, ſeems to reconcile their difference; becauſe, as Thucidydes obſerves, it was waſhed on two ſides by the Strymon, which dividing itſelf into two channels, the city ſtood in the middle, and on the ſide towards the ſea there was a wall built from channel to channel. Its ancient name was Εννεα οδοι, the *Nine Ways*, (Thucidydes, Herodotus.) The citizens were called *Amphipolitani*, (Livy.) It was afterwards called *Chriſtopolis*; now *Chriſopoli*, or *Chiſopoli*, (Holſtenius.)

Amphipolis, a town of Syria, on the Euphrates, built by Seleucus, called by the Syrians *Turmeda*, (Stephanus): the ſame with *Thapſacus*, (Pliny); and ſuppoſed to have been only renewed and adorned by Seleucus, becauſe long famous before his time, (Xenophon.)

AMPHIPPII, in Grecian antiquity, ſoldiers who, in war, uſed two horſes without ſaddles, and were dextrous enough to leap from one to the other.

AMPHIPRORÆ, in the naval affairs of the ancients, veſſels with a prow at each end. They were uſed chiefly in rapid rivers and narrow channels, where it was not eaſy to tack about.

AMPHIPROSTYLE, in the architecture of the ancients, a temple which had four columns in the front, and as many in the aſpect behind.

AMPHISBÆNA, in zoology, a genus of ſerpents belonging to the order of amphibia ſerpentes, ſo called from the falſe notion of its having two heads, becauſe it moves with either end foremoſt.

The head of the amphiſbæna is ſmall, ſmooth, and blunt; the noſtrils are very ſmall; the eyes are minute and blackiſh; and the mouth is furniſhed with a great number of ſmall teeth. The body is cylindrical, about a foot long, and divided into about 200 annular convex ſegments like thoſe of a worm; and it has about 40 longitudinal ſtreaks, of which 12 on each ſide are in the form of ſmall croſſes like the Roman X; the anus is a tranſverſe ſlit; and the laſt ring or ſegment of the belly has eight ſmall papillæ, forming a tranſverſe line before the anus; the tail, *i. e.* all the ſpace below the anus, is ſhort, conſiſting of 30 annular ſegments, without being marked with the croſs-lines, and is thick and blunt at the point. The colour of the whole animal is black, variegated with white; but the black prevails moſt on the back, and the white on the belly. It has a great reſemblance to a worm, living in the earth, and moving equally well with either end foremoſt. There are but two ſpecies, viz. 1. The fuliginoſa, which anſwers exactly to the above deſcription, and is found in Libya and in different parts of America. 2. The alba, which is totally white, is a native of both the Indies, and is generally found in ant-hillocks. The bite of the amphiſbæna is reckoned to be mortal by many authors; but as it is not furniſhed with dog-fangs, the uſual inſtruments of conveying the poiſon of ſerpents, later writers eſteem it not to be poiſonous. They feed upon ants and earth-worms, but particularly the latter. See Plate XVIII.

Amphisbæna Aquatica, a name given by Bertrutius, Albertus, and ſeveral other authors, to that long and ſlender inſect, called by others the *ſeta aquatica*, and *vermis ſetarius*. It has the name *amphiſbæna*, from its going backwards or forwards with equal eaſe and celerity. The uſual ſize is four or five inches long, and the thickneſs of a large hair.

Dr Liſter accidentally found out the origin of this worm, in his reſearches into the hiſtory of a very different ſort of inſect. Diſſecting one of the common black beetles dug up in a garden, he found in its belly two of theſe hair worms, or amphiſbænæ; and renewing the experiment on other beetles of the ſame ſpecies, he found that they uſually contained, one, two, or three of theſe worms. As ſoon as the body of the beetle is opened, they always crawl out. When put into water they will live a conſiderable time, and ſwim nimbly about; but often put up their heads above water, as if endeavouring to make their eſcape, and ſometimes faſtening themſelves by the mouth to the ſides of the veſſel, and drawing their whole bodies after them. Theſe creatures are not only found in the waters, but buried in earth, and ſometimes on the leaves of trees, in our gardens and hedges. Phil. Tranſ. Nº 83.

AMPHISCII, among geographers, a name applied to the people who inhabit the torrid zone. The Amphiſcii, as the word imports, have their ſhadows one part of the year towards the north, and the other towards the ſouth, according to the ſun's place in the ecliptic. They are alſo called *Aſcii*. See Ascii.

AMPHISSA, (anc. geog.), the capital of the Locri Oxolæ, 120 ſtadia (or 15 miles) to the weſt of Delphi, (Pauſanias.) So called, becauſe ſurrounded on all hands by mountains, (Stephanus.) Hence *Amphiſſæi*, the inhabitants; who plundered the temple at Delphi, (Demoſthenes.)—Alſo a town of Magna Græcia, at the mouth of the Sagra, on the coaſt of the Farther Calabria, ſituated between Locri and Caulona; now called *Rocella*. *Amphiſſius* the epithet, (Ovid.)

AMPHITANE, among ancient naturaliſts, a ſtone ſaid to attract gold as the loadſtone does iron. Pliny ſays it was found in that part of the Indies where the native gold lay ſo near the ſurface of the earth as to be turned up in ſmall maſſes among the earth of anthills;

hills; and deſcribes it to have been of a ſquare figure, and of the colour and brightneſs of gold. The deſcription plainly points out a well-known foſſil, called, by Dr Hill, *pyricubium:* this is common in the mines of moſt parts of the world; but neither this nor any other ſtone was ever ſuppoſed, in our times, to have the power of attracting gold.

AMPHITHEATRE, in antiquity, a ſpacious edifice, built either round or oval, with a number of riſing ſeats, upon which the people uſed to behold the combats of gladiators, of wild beaſts, and other ſports.

Amphitheatres were at firſt only of wood; and it was not till the reign of Auguſtus, that Statilius Taurus built one, for the firſt time, of ſtone. The lower part was of an oval figure, and called *arena,* becauſe, for the conveniency of the combatants, it was uſually ſtrewed with ſand; and round the arena were vaults ſtyled *caveæ,* in which were confined the wild beaſts appointed for the ſhews.

Above the caveæ was erected a large circular periſtyle, or podium, adorned with columns. This was the place of the emperors, ſenators, and other perſons of diſtinction.

The rows of benches were above the podium. Their figure was circular; and they were entered by avenues, at the end of which were gates called *vomitoriæ.*

This theatre was built in form of a ſemicircle, only exceeding a juſt ſemicircle by one fourth part of the diameter; and the amphitheatre was nothing elſe but a double theatre, or two theatres joined together: ſo that the longeſt diameter of the amphitheatre was to the ſhorteſt as $1\frac{1}{2}$ to 1.

There are amphitheatres ſtill ſtanding at Rome, at Pola, at Niſmes, &c. The amphitheatre of Veſpaſian, called the *Coliſeum,* and that at Verona in Italy, are the moſt celebrated now remaining of all antiquity. Remains of amphitheatres are ſhown alſo at Arles, Bourdeaux, &c. The amphitheatre at Pola, an ancient republic of Iſtria, is very entire: it conſiſts of two orders of Tuſcan pillars, one over the other. The lower have pedeſtals, which is extraordinary; this order having ſcarce ever more than baſes to ſupport them. The amphitheatre of Veſpaſian is computed to have been capable of holding 87,000 ſpectators. That of Verona is the beſt preſerved: for though moſt of the great and beſt ſtones of the outſide are picked out, yet the great vault, on which the rows of the ſeats are laid, is entire; the rows alſo (which are 44 in number) are entire. Every row is a foot and a half high, and as much in breadth; ſo that a man ſits conveniently in them; and allowing for a ſeat a foot and a half, the whole will hold 23,000 perſons. Pliny mentions an amphitheatre built by Curio, which turned on large iron pivots; ſo that of the ſame amphitheatre two ſeveral theatres were occaſionally made, whereon different entertainments were ſometimes preſented at the ſame time. Mr Brydone (vol. i. 295.) mentions an amphitheatre at Syracuſe, the theatre of which is ſo entire, that the *gradini* for ſeats ſtill remain; but it is a ſmall theatre, he ſays, in compariſon of the others. See Plate XVI.

AMPHITHEATRE, in gardening, certain diſpoſitions of trees and ſhrubs on the ſides of hilly places, which, if the hill or riſing be naturally of a circular figure, always have the beſt effect. They are to be formed of evergreens, ſuch as hollies, phillereys, lauruſtines, bays, and ſuch plants, obſerving to plant the ſhorteſt growing trees in the front, and thoſe which will be the talleſt behind, ſuch as pines, firs, cedars of Lebanon, &c.

Amphitheatres are alſo ſometimes formed of ſlopes on the ſides of hills, covered only with turf; and when well kept, they are a great ornament to large gardens.

AMPHITRITE, (αμφιτριτη, from *circumferendo*), in the heathen mythology, the wife of Neptune, and goddeſs of the ſea, ſometimes taken for the ſea.

AMPHITRYON, ſon of Alcæus, leſs known by his own exploits than from his wife Alcmena's adventure. See ALCMENA.

AMPHORA, in antiquity, a liquid meaſure among the Greeks and Romans. The Roman amphora contained 48 ſextaries, equal to about ſeven gallons one pint Engliſh wine-meaſure; and the Grecian or Attic amphora contained one-third more.

AMPHORA was alſo a dry meaſure uſed by the Romans, and contained about three buſhels.

AMPHORA, among the Venetians, is the largeſt meaſure uſed for liquids, containing about 16 quarts.

AMPHORARIUM VINUM, in antiquity, denotes that which is drawn or poured into *amphoræ* or pitchers; by way of diſtinction from *vinum doliare,* or caſk wine.—The Romans had a method of keeping wine in *amphoræ* for many years to ripen, by faſtening the lids tight down with pitch or gypſum, and placing them either in a ſituation where the ſmoke came, or under ground.

AMPHOTIDES, in antiquity, a kind of armour or covering for the ears, worn by the ancient pugiles, to prevent their adverſaries from laying hold of that part.

AMPHRYSUS, or AMPHRYSSUS, (anc. geog.) a river of Phthiotis, a diſtrict of Theſſaly, running by the foot of mount Othrys, from ſouth to north, into the Enipeus at Thebes of Theſſaly; where Apollo fed the herds of king Admetus (Virgil, Lucan). Another Amphryſus in Phrygia, rendering women barren, according to Pliny: Hence the epithet *Amphryſiacus* (Statius). Alſo a town of Phocis, at the foot of mount Parnaſſus, encompaſſed with a double wall by the Thebans in the war with Philip (Pauſanias); *Amphryſia Vates,* in Virgil, denotes the Sibyl.

AMPHTHILL, a town in Bedfordſhire, ſeated pleaſantly between two hills, but in a barren ſoil. W. Long. 0. 29. N. Lat. 52. 2.

AMPLIATION, in a general ſenſe, denotes the act of enlarging or extending the compaſs of a thing.

On a medal of the emperor Antoninus Pius, we find the title *Ampliator civium* given him, on account of his having extended the *jus civitatis,* or right of citizenſhip, to many ſtates and people before excluded from that privilege. In effect, it is generally ſuppoſed to have been this prince that made the famous conſtitution, whereby all the ſubjects of the empire were made citizens of Rome.

AMPLIATION, in Roman antiquity, was the deferring to paſs ſentence in certain cauſes. This the judge did, by pronouncing the word *amplius;* or by writing the letters N. L. for *non liquet;* thereby ſignifying, that, as the cauſe was not clear, it would be neceſſary to bring further evidence.

AMPLIFICATION, in rhetoric, part of a diſcourſe or ſpeech, wherein a crime is aggravated, a praiſe or commendation heightened, or a narration enlarged, by an enumeration of circumſtances; ſo as to excite the proper emotions in the ſouls of the auditors. Such is the paſſage in Virgil, where, inſtead of ſaying merely that Turnus died, he amplifies the circumſtances of his death.

> *—Aſt illi ſolvuntur frigore membra,*
> *Vitaque cum gemitu fugit indignata ſub umbras.*

The maſters of eloquence make amplification to be the ſoul of diſcourſe. See ORATORY, n° 39.

AMPLITUDE, in aſtronomy, an arch of the horizon intercepted between the eaſt or weſt point and the centre of the ſun, or a planet, at its riſing or ſetting; and ſo is either north and ſouth, or ortive and occaſive.

Magnetical AMPLITUDE, the different riſing or ſetting of the ſun from the eaſt or weſt points of the compaſs. It is found by obſerving the ſun, at its riſing and ſetting, by an amplitude-compaſs.

AMPSAGA, a river of ancient Numidia. See ALGIERS, n° 57.

AMPSANCTI VALLIS, or AMPSANCTI LACUS, a cave or lake in the heart of the Hirpini, or Principato Ultra, near the city Tricento (Cicero, Virgil, Pliny); it is now called *Moffetta*, from Mephitis, the goddeſs of ſtench, who had a temple there. The ancient poets imagined that this gulf led to hell. The Moffetta is thus deſcribed by Mr Swinburn: "We were led into a narrow valley, extending a conſiderable way to the ſouth-weſt, and preſſed in on both ſides by high ridges thickly covered with copſes of oak. The bottom of the dell is bare and arid: in the loweſt part, and cloſe under one of the hills, is an oval pond of muddy aſh-coloured water, not above 50 feet in diameter: it boils up in ſeveral places with great force in irregular fits, which are always preceded by a hiſſing ſound. The water was ſeveral times ſpouted up as high as our heads in a diagonal direction, a whirlpool being formed round the tube, like a baſon, to receive it as it fell. A large body of vapour is continually thrown out with a loud rumbling noiſe. The ſtones on the riſing ground that hangs over the pool are quite yellow, being ſtained with the fumes of ſulphur and ſal-ammoniac. A moſt nauſeous ſmell riſing with the ſteam obliged us to watch the wind, and keep clear of it, to avoid ſuffocation. The water is quite inſipid both as to taſte and ſmell; the clay at the edges is white, and carried into Puglia to rub upon ſcabby ſheep, on which account the lake is farmed out at 100 ducats a-year. On a hill above this lake ſtood formerly a temple dedicated to the goddeſs Mephitis; but I perceived no remains of it."

AMPULLA, in antiquity, a round big-bellied veſſel which the ancients uſed in their baths to contain oil for anointing their bodies.—Alſo the name of a cup for drinking out of at table.

AMPULLA, among eccleſiaſtical writers, denotes one of the ſacred veſſels uſed at the altars. Ampullæ were alſo uſed for holding the oil uſed in chriſmation, conſecration, coronation, &c. Among the ornaments of churches we find frequent mention made of ampuls or vials. In the inventory of the cathedral of Lincoln we meet with ampuls of cryſtal, variouſly enriched with ſilver feet and covers; one containing a tooth of St Chriſtopher, another a tooth of St Cecily, another a bone of the head of St John Baptiſt.

Knights of St AMPULLA, belonging to an order inſtituted by Clovis I. king of France; at the coronation they bear up the canopy, under which the ampulla is carried in proceſſion.

AMPURA, a province of the kingdom of Peru, before its conqueſt by the Spaniards. Here the inhabitants worſhipped two lofty mountains from a principle of gratitude, becauſe of the deſcent of the water from them by which their lands were fertilized. It is ſaid to have been conquered by Virachoca, the eighth inca.

AMPURIAS, the capital of the territory of Ampurdan, in Catalonia, ſeated at the mouth of the river Fluvia, in E. Long. 2. 56. N. Lat. 42. 5. The land about it is barren, full of briars and bulruſhes, except in ſome places, which produce flax.

AMPUTATION, in ſurgery, the cutting off a limb, or any part, from the body. See SURGERY-*Index*.

AMRAPHEL, the king of Shinar, or, Babylonia, confederated with Chedorlaomer, king of the Elamites, and two other kings, to make war againſt the kings of Pentapolis; that is to ſay, of Sodom, Gomorrah, and the three neighbouring cities. The kings who were in league with Amraphel worſted thoſe of Pentapolis, plundered their city, and carried off abundance of captives, among whom was Lot, Abraham's nephew: but Abraham purſued them, retook Lot, and recovered all the ſpoil. See ABRAHAM.

AMRAS, a ſtrong caſtle of Germany, ſeated in Tirol; by ſome German writers called *Arx Ambroſiana*, which was a houſe of pleaſure for the archdukes to retire to in the heat of the ſummer. By others this fort is called *Ombraſs*; a name derived from the deſign of it, which was to be a ſhady ſummer-houſe. It is moſt delightfully ſituated at the foot of a mountain, but has no great external beauty. All the furniture of ordinary uſe has been carried away; yet it is ſtill remarkable for its galleries, which contain a very large collection of antiquities, and both natural and artificial curioſities. It excels all others in its curious collection of armour and coats of mail, many of which belonged to very great men. There is alſo a great collection of gold medals, which weigh, as they affirm, about 16 pounds; there are alſo 3000 cameos and intaglios, but few of them very fine. A great part of theſe antiquities were ſent to this place by Charles V. On the walls and cieling there are ſome very good paintings; and, among the reſt, they have an admirable picture of Noah's ark, done by Baſſano, for which the grand duke of Tuſcany is ſaid to have offered 100,000 crowns. They have a library, which is not in very good order; and a gallery full of buſts and other pieces of antiquity, beſides many other apartments adorned with pictures of great value. E. Long. 11. 40. N. Lat. 47. 0.

AMSANCTI. See AMPSANCTI.

AMSBURY, or AMBURSBURY, a town in Wiltſhire, lying in W. Long. 1. 20. N. Lat. 51. 29. It is the *Pagus Ambri*, famous for a monaſtery built by one Ambrus, and afterwards for a nunnery of noble women. There is a nobleman's ſeat here, built by Inigo Jones, to which new works were added under the direction of Lord Burlington. It is 80 miles weſt of London, and ſix miles north of Saliſbury.

AMSDORFIANS, in church-hiſtory, a ſect of Proteſtants in the 16th century, who took their name from Amſdorf their leader. They maintained, that good works were not only unprofitable, but were obſtacles to ſalvation.

AMSTERDAM, the capital city of the province of Holland and of the United Netherlands, is ſeated on the river Amſtel and an arm of the ſea called the *Wye*. The air is but indifferent, on account of the marſhes that ſurround it, and render the city almoſt inacceſſible: but this inconvenience is abundantly recompenſed by the utility of its commerce, which the port ſerves greatly to promote; for it will contain above a thouſand large ſhips.

In 1204, it was nothing but a ſmall caſtle, called *Amſtel* from the name of the river, which its lords made a retreat for fiſhermen, who at firſt lived in huts covered with thatch: but it ſoon became conſiderable, and had a bridge and towers built about it, inſomuch that it roſe to a ſmall city; though, till the year 1490, it was ſurrounded with nothing but a weak palliſado. The walls were then built with brick, to defend it from the incurſions of the inhabitants of Utrecht, with whom the Hollanders were often quarrelling; but ſome months afterwards it was almoſt reduced to aſhes. In 1512, it was beſieged by the people of Guelderland; who, not being able to take it, ſet fire to the ſhips in the harbour. In 1525, an Anabaptiſt leader, with 600 of his followers, got into the city in the night-time, attacked the town-houſe, and defeated thoſe that made any reſiſtance. At length they barricaded, with wool and hop-ſacks, the avenues to the market-place, where theſe enthuſiaſts were poſted; and ſo put a ſtop to their fury till day appeared, at which time the citizens fell upon them on all ſides, and forced them to retire into the town-houſe, where moſt of them were cut to pieces. About ten years after, there was another tumult raiſed by a parcel of fanatics, conſiſting of men and women, who ran about the ſtreets ſtark naked, and had a deſign of making themſelves maſters of the town-houſe. Their ſhrieks and cries, which were dreadful enough, ſoon alarmed the inhabitants, who ſeized the greateſt part of them, and gave them the chaſtiſement they deſerved.

Amſterdam was one of the laſt cities that embraced the reformed religion. It was beſieged by the Hollanders in 1578, and ſubmitted after a ſiege of ten months. One article of the capitulation was, a free exerciſe of the Roman-catholic religion: but this was not obſerved by the Proteſtants; for they ſoon drove the eccleſiaſtics, monks, and nuns, out of the city, broke the images, and demoliſhed the altars. From this time it became the general rendezvous of all nations and of every ſect, which raiſed it to that degree of grandeur and opulence it now enjoys. The inhabitants were often obliged to enlarge the bounds of their city, and in 1675 it was increaſed to its preſent extent. It was ſurrounded with a brick wall, and a large ditch, 80 feet broad, full of running water. The walls were fortified with 26 baſtions, on each of which there is now a windmill. There are eight gates towards the land, and one towards the water.

Amſterdam being ſeated on a marſhy ſoil, is built on piles of wood; for which reaſon no coaches are allowed, except to great men and phyſicians, who pay a tax for that privilege; and all kinds of goods are drawn on ſledges. It ſtands ſo low, that they would be expoſed to inundations, if they did not ſecure themſelves by dikes and ſluices. The fineſt ſtreets are, the Keyſar's Graft, or Emperor's Canal; the Heer Graft, or Lord's Canal; the Cingel; and the ſtreet of Haerlem. The principal canal is remarkable for its houſes, which are magnificent ſtructures of an equal height. Here are three prodigious ſluices, and a great number of canals, which croſs the city in many parts, and render the ſtreets clean and pleaſant. The canals are deep, their ſides are lined with hewn ſtone, they have generally rows of trees planted on each ſide, and many ſtone-bridges over different parts of them.

The fineſt is that called the *Ammarack*, which is formed by the waters of the Amſtel, into which the tide comes up, and on the ſides of which are two large quays. This canal has ſeveral bridges. The principal is that next the ſea, called *Pont-Neuf*, or the *New Bridge*: it is 600 feet long, and 70 broad, with iron baluſtrades on each ſide; it has 36 arches, of which 11 are very high, and eight are ſhut up to incloſe the yachts. From this bridge there is a moſt charming proſpect of the city, port, and ſea. The port is a mile and a half in length, and above 1000 paces in breadth. It is always filled with a multitude of veſſels, which look like a foreſt, or rather a floating city. The ſtreets are in general well paved, and the houſes built of brick or ſtone. Towards the ſides of the haven, the city is incloſed with great poles driven into the ground, which are joined by large beams placed horizontally. There are openings to let the ſhips in and out, which are ſhut every night at the ringing of a bell.

Amſterdam is computed to be half as big as London, including the fortifications, and almoſt as populous in proportion. There are people here of almoſt every nation and religion in Europe, who are all tolerated in their reſpective perſuaſions; but none admitted to any ſhare in the government except the Calviniſts. There are eleven churches for the Dutch of the eſtabliſhed or Calviniſtical religion, with two French and one High Dutch. The Engliſh have alſo three churches in this city; one for the Preſbyterians, whoſe miniſters are paid by the magiſtrates; a ſecond for thoſe of the church of England, whoſe miniſter is paid by his Britannic majeſty; and a third for the Browniſts, who maintain their own miniſters. None but the Calviniſts are allowed to have bells, and their miniſters are maintained by the magiſtrates. All theſe churches or congregations make up only a third part of the inhabitants of the city. The Roman Catholics, who have 27 houſes or chapels, for their worſhip, form another third part. Here they have a long ſquare of houſes for their beguines (a kind of nuns) to live in; who are not ſhut up in cloyſters as other nuns in Roman-Catholic countries, but have liberty to walk abroad, and may even marry when they are tired of this kind of life. Theſe chapels of the Roman-catholics have no bells allowed them, being looked upon as conventicles, and may be ſhut up and opened according as the government pleaſes. The other third part of the city is made up of Jews, Lutherans, Arminians, Anabaptiſts,

&c. none of whom, as was ſaid of the Roman-Catholics, are allowed to have bells in their churches. Thoſe who marry, and are not of the eſtabliſhed religion, are obliged to be joined firſt by the magiſtrates, and then they may perform the ceremony in their own aſſemblies. The Jews, who are very conſiderable in this place, have two ſynagogues; one of which, namely, the Portugueſe, is the largeſt in Europe. Within the court-yard, where their ſynagogue ſtands, they have ſeveral rooms or ſchools, where their children are taught Hebrew, and very carefully inſtructed in the Jewiſh religion.

The moſt remarkable of the religious buildings is the New Church, dedicated to St Catharine. It was begun in the year 1408, others ſay 1414; and was 100 years a-building. It had the misfortune of being burnt in the year 1645, but was in a ſhort time after built in a more magnificent manner. The foundation of a ſteeple is laid before this church, which was deſigned to be very high. The piles on which it was to be erected are not above 100 feet ſquare, and yet they are 6334 in number, and thoſe very large. Nevertheleſs it was thought that theſe vaſt piles, or rather the ground, were not able to ſupport the prodigious weight they intended to lay upon it; for which reaſon the ſteeple remains unfiniſhed. The pulpit is a maſterpiece of the kind, where the four evangeliſts and many other curious pieces of ſculpture are repreſented. The glaſs-windows are adorned with paintings, among which the emperor Maximilian is deſcribed, preſenting an imperial crown to the burgomaſters of Amſterdam for the creſt of the arms of this city. The organ is very large, and reckoned one of the beſt in the world. It has a ſet of pipes that counterfeit a chorus of voices, and has 52 whole ſtops, beſides half ſtops, with two rows of keys for the feet, and three rows of keys for the hands. Thoſe who hear it play for the firſt time, imagine they hear a human voice. The grate dividing the chancel from the body of the church is all of Corinthian braſs. The branches of candleſticks are the richeſt in the Seven Provinces. There is a very fine marble monument erected to Admiral Ruyter, who was killed at Meſſina.

The public buildings of a civil nature are very magnificent. The ſtadt-houſe was founded in 1648. It is built upon 14,000 wooden piles; and its front is 282 feet long, its ſides 255 feet, and its height to the roof 116. There is a marble pediment in the front, whereon a woman is carved in relievo, holding the arms of the city; ſhe is ſeated in a chair, ſupported by two lions, with an olive branch in her right hand; on each ſide are four Naiads, who preſent her with a crown of palm and laurel, and two other marine goddeſſes preſent her with different ſorts of fruit; beſides, there is Neptune with his trident, accompanied with Tritons, a ſea-unicorn, and a ſea-horſe. On the top ſtand three ſtatues in bronze, repreſenting Juſtice, Strength, and Plenty. On the top of the ſtructure is a round tower, 50 feet above the roof, adorned with ſtatues, and an harmonious chime of bells, the biggeſt of which weighs about 7000 pounds, and the next 6000. They are made to play different tunes every month. It has not one handſome gate, but only ſeven doors to anſwer to the number of the United Provinces. On the floor of the great hall are two globes, the celeſtial and terreſtrial, which are 22 feet in diameter and 69 in circumference. They are made of white and black marble, and are inlaid with jaſper and copper. In general all the chambers are enriched with paintings, carvings, and gildings. While this ſtadt-houſe was building, the old one was ſet on fire, and conſumed with all the archives and regiſters.

Under the ſtadt-houſe is a prodigious vault, wherein is kept the bank of Amſterdam, where there is a vaſt quantity of ingots both of gold and ſilver, as alſo bags, which are ſuppoſed to be full of money. The doors are proof againſt petards, and are never opened but in the preſence of one of the burgomaſters. The priſons for debtors and criminals are likewiſe under the ſtadt-houſe: as alſo the guard-room for the citizens, wherein the keys of the city are locked every night. At the end of the great hall is the ſchepens or aldermens chamber, where civil cauſes are tried. Beſides theſe, there are the chambers of the ſenate and council, the burgomaſters chamber, the chambers of accounts, &c. In the ſecond ſtory is a large magazine of arms; and on the top of the building are ſix large ciſterns of water, which may be conveyed to any room in the houſe in caſe of fire; to prevent which the chimnies are lined with copper.

The bourſe, or exchange, where the merchants aſſemble, is all of free-ſtone, and built upon 2000 wooden piles. Its length is about 250 feet and its breadth 140. The galleries are ſupported by 26 marble columns, upon each of which are the names of the people that are to meet there. They are all numbered; and there is a place affixed for every merchandize under ſome one of theſe numbers. On the right hand of the gate is a ſuperb ſtair-caſe which leads to the galleries; on one ſide of which there are ſeveral ſhops, and on the other a place to ſell clothes. It is not unlike the royal exchange in London.

The admiralty-office is in a houſe which belonged formerly to the princes of Orange. The arſenal for their men of war is in the harbour. This is a very handſome building, 200 feet long and 22 broad. The ground floor is filled with bullets; the ſecond floor contains the arms and cordage; the third their ſails, pulleys, flags, &c. This arſenal contains a great many curioſities; among the reſt an Indian canoe brought from the ſtraits of Davies, and a conſervatory of water on the top of the houſe that holds 1600 tuns of water, which may be diſtributed in caſe of fire into 16 different parts by leaden pipes. Hard by this edifice you ſee the dock or yard where they build their men of war. This dock is 508 feet long, and contiguous to it are houſes for lodging the ſhip-carpenters. The dock is plentifully ſupplied with every thing neceſſary for the conſtruction of ſhips.

The Eaſt-India Company occupy a large building divided into ſeveral offices or apartments. In ſome of thoſe they have great ſtores of packed goods, and likewiſe a room with all ſorts of drugs, tea, wax, ambergriſe, and muſk. Here they have a magazine full of medicaments for ſurgeons cheſts, to furniſh the company's ſhips and garriſons in the Indies; as alſo large magazines of nutmegs, cloves, mace, and cinnamon. In the court-yard there is a guard-chamber, where every night the houſe-keeper has a watch; and on the other ſide of the gate, there is a chemiſt, who with his men prepares medicines for the Indies; and adjoining to this court-yard is their warehouſe and packhouſe for pepper and groſs goods. In the new part of the city they have a magazine or palace, which may properly be called an *arſenal*. The ground on which the building ſtands is 2000 feet, and ſquare every way, reckoning the moats or burgwall about it. The two rope-alleys are 1800 feet long, on the backſide of which is a ſtore of 500 large anchors beſides ſmall ones. In this arſenal they build the ſhips belonging to the India chamber of Amſterdam; for which reaſon they have all ſorts of workhouſes here for the artificers that ſerve the company.

The academy, called the *Illuſtrious School*, is likewiſe a very fine building. It was formerly a convent belonging to the nuns of St Agnes. Here they teach Latin, the oriental languages, theology, philoſophy, hiſtory, &c. The lawyers and phyſicians have likewiſe their ſchools.

Beſides theſe, there are ſeveral hoſpitals, or houſes for orphans, for poor widows, for ſick perſons, and for mad people; all which are regulated with much prudence. The Raſp-houſe, which was formerly a nunnery, is now a ſort of a work-houſe for men that behave ill. They are commonly ſet to ſaw or raſp Braſil wood; and if they will not perform their taſk, they are put into a cellar which the water runs into, where if they do not almoſt conſtantly ply the pump, they run the riſk of being drowned. There is likewiſe a ſpin-houſe for debauched women, where they are obliged to ſpin wool, flax, and hemp, and do other work. All the hoſpitals are extremely neat, and richly adorned with pictures. They are maintained partly by voluntary contributions, which are raiſed by putting money into the poor's boxes fixed up all over the city; and partly by taxing all public diverſions, as well at fairs as elſewhere. Likewiſe every perſon that paſſes through any of the gates at candle-light pays a penny for the ſame uſes. Theſe charities are taken care of by certain officers called *deacons*. The governors are nominated by the magiſtrates out of the moſt conſiderable men in the city.

The common ſort have places of diverſion called *Spiel-houſes*, where there are muſic and dancing. They are much of the ſame kind as the hops which were ſo frequent about London. If ſtrangers go there, they muſt take care not to make their addreſſes to a woman that is engaged to any other man.

There are two ſuburbs to this city; one at the gate of the regulars; and the other goes as far as Overtoon, a village a little way from Amſterdam, where boats which come from Leyden are rolled over land upon wooden rollers. There is likewiſe in this city an hoſpital for thoſe that are infected with the plague; which was built in the year 1630, and has 360 windows.

The city is governed by a ſenate or council, which conſiſts of 36 perſons, called a *Vroedſhap*, who enjoy their places for life; and when any of them dies, the remainder chooſe another in his ſtead. This ſenate elects deputies to be ſent to the States of Holland, and appoints the chief magiſtrates of the city, called *Burgomaſters* or *Echevins*, who are like our aldermen. The number is twelve; out of which four are choſen every year to execute the office, and are called *Burgomaſters-regent*. Three of thoſe are diſcharged every year, to make room for three others. One of the four is kept in to inform the new ones of the ſtate of affairs, and alſo preſides the three firſt months in the year, and the others, three months each; ſo that, when they are in this office, they may be compared to the lord-mayor of the city of London. Theſe alterations and appointments are made by their own body. They diſpoſe of all inferior offices which become vacant during their regency. They have likewiſe the direction of all public works, which regard the ſafety, tranquillity, and embelliſhment of the city. The keys of the famous bank of this city are in the hands of theſe magiſtrates.

The college conſiſts of new burgomaſters or echevins, who are judges in all criminal affairs, without appeal; but in civil cauſes they may appeal to the council of the province. There are two treaſurers, a bailiff, and a penſionary. The bailiff continues in his office three years; and ſearches after criminals, takes care to proſecute them, and ſees their ſentence executed. The penſionary is the miniſter of the magiſtracy, is well verſed in the laws, makes public harangues, and is the defender of the intereſts of the city. The city of Amſterdam contributes to the public income above 50,000 livres per day, beſides the exciſe of beer, fleſh, and corn; which, in all, amounts to above 1,600,000l. a-year. This is more than is paid by all the reſt of the provinces put together; and yet Amſterdam bears but the fifth rank in the aſſembly of the ſtates of Holland, with this diſtinction, that whereas other cities ſend two members, this ſends four.

The militia of Amſterdam is very conſiderable. They have 60 companies, each of which has from 200 to 300 men. Jews and Anabaptiſts are excluded from this ſervice, not being admitted to bear arms: But they are obliged to contribute to the maintenance of the city-guard, which conſiſts of 1400 ſoldiers; as alſo to the night-watch, who patrole about the ſtreets, and proclaim the hour. Beſides theſe, there are trumpeters on every church ſteeple, who ſound every half hour; and if there happens a fire, they ring the fire-bell, and ſhow where it is. The inhabitants have excellent contrivances to extinguiſh it ſpeedily.

The trade of Amſterdam is prodigious: for almoſt the whole trade of the Eaſt India company centres in this city, which beſides carries on a commerce with all the reſt of the world, inſomuch that it may be called the magazine or ſtore-houſe of Europe. They import a vaſt deal of corn from the Baltic, not ſo much for preſent conſumption, as to lay up againſt times of ſcarcity. The richeſt ſpices are entirely in the hands of the Eaſt-India company, who furniſh all Europe therewith. They have vaſt quantities of military ſtores, with which they ſupply ſeveral nations; which is owing to their engroſſing moſt of the iron-works on the Rhine and other great rivers that run into Holland. The longitude of Amſterdam is 4. 30. E.; the latitude, 52. 25. N.

Amsterdam, is alſo the name of an iſland in the ſouth-ſea, ſaid to have been diſcovered by Taſman, a Dutch navigator. It was viſited by Captain Cook in his late voyages. Its greateſt extent from eaſt to weſt is about 21 miles, and from north to ſouth about 13. It is broad at the eaſt end, and runs taper towards the weſt, where it turns, and runs to a point due north. It is about ſix leagues to the weſt of Middleburgh.

Amſterdam

The ſhore is ſurrounded by a coral rock, and its moſt elevated parts are not above ſix or eight yards above the level of the ſea. S. Lat. 21. 11. W. Long. 175. It is wholly laid out in plantations, in which are cultivated ſome of the richeſt productions of nature.

Here are bread-fruit, cocoa-nut trees, plantains, bananas, ſhaddocks, yams and ſome other roots, ſugarcanes, and a fruit like a nectarine, called by the natives *fighega*. There did not appear an inch of waſte ground: the roads occupied no more ſpace than was abſolutely neceſſary: the fences did not take up above four inches each; and even theſe were not wholly loſt, for in many grew ſome uſeful trees or plants: it was every where the ſame, change of place altered not the ſcene: nature, aſſiſted by a little art, nowhere appeared with more ſplendour than on this iſland. Water is not ſo plentiful here as at the Society-iſlands; but the chief pointed out a pool of freſh water unaſked, to ſupply the ſhips with that neceſſary article. Caſuarinas, pandangs, and wild ſago-palms, appear here with their various tints of green, and barringtoniæ as big as the loftieſt oaks. The bread-fruit does not, however, thrive here with the ſame luxuriance as at the Society-iſlands; the coral rock, which compoſes the baſis of this ſpot, being much more thinly covered with mould.

Both men and women are of the common ſize of Europeans, and their colour is that of a lightiſh copper; they are well-ſhaped, have regular features, are active, briſk, and lively. They have fine eyes, and in general good teeth, even to an advanced age. The women are the merrieſt creatures imaginable, and inceſſant talkers. In general, they appear to be modeſt; although there was no want of thoſe of a different ſtamp. Among the natives, who ſwam about the ſhip very vociferouſly, were a conſiderable number of women, who wantoned in the water like amphibious creatures, and were eaſily perſuaded to come on board perfectly naked; but none of them ventured to ſtay there after ſunſet, but returned to the ſhore to paſs the night, like the greater part of the inhabitants, under the ſhade of the wild wood which lined the coaſt. There they lighted great fires, and were heard converſing almoſt the whole night. The hair of both ſexes in general is black, but eſpecially that of the women; both ſexes wear it ſhort, except a ſingle lock on the top of the head, and a ſmall quantity on each ſide. The men cut or ſhave their beards quite cloſe, which operation they perform with two ſhells. The hair of many was obſerved to be burnt at the ends, and ſtrewed with a white powder, which was found, on examining it, to be lime made of ſhell or coral, which had corroded or burnt the hair; ſome made uſe of a blue powder, and others, both men and women, of an orange-coloured powder made of turmeric.

The dreſs of both ſexes conſiſts of a piece of cloth or matting wrapped round the waiſt, and hanging down below the knees. From the waiſt upwards they are generally naked, and it ſeems to be a cuſtom to anoint theſe parts every morning. The practice of tattowing, or puncturing the ſkin, likewiſe prevails. The men are tattowed from the middle of the thigh to above the hips; the women have it only on their arms and fingers, and on thoſe parts but very ſlightly. Their ornaments are amulets, necklaces, and bracelets, the bone, ſhells, and beads of mother-of-pearl, tortoiſe-ſhell, &c. which are worn by men as well as women. The women alſo wear on their fingers neat rings made of tortoiſe-ſhell, and pieces in their ears about the ſize of a ſmall quill; but here ornaments are not commonly worn, though all have their ears pierced. They have alſo a curious apron, made of the cocoa-nut ſhell, and compoſed of a number of ſmall pieces ſewed together in ſuch a manner as to form ſtars, half-moons, little ſquares, &c.; it is ſtudded with beads and ſhells, and covered with red feathers, ſo as to have a pleaſing effect. They make the ſame kind of cloth, and of the ſame materials, as at O-Taheitee, though they have not ſuch a variety, nor do they make any ſo fine; but, as they have a method of glazing it, it is more durable, and will reſiſt rain for ſome time, which the other cloth would not. Their colours are black, brown, yellow, purple, and red; all made from vegetables. They make various ſorts of matting, ſome of a very fine texture, which is generally uſed for clothing; and the thick and ſtronger ſort ſerves to ſleep upon, and to make ſails for their canoes, &c. Among other uſeful utenſils, they have various ſorts of baſkets, ſome made of the ſame materials as their mats, and others of the twiſted fibres of cocoa-nuts. Theſe are not only durable, but beautiful, being generally compoſed of different colours, and ſtudded with beads made of ſhells or bones. They have many little nicknacks among them, which ſhow that they neither want taſte to deſign, nor ſkill to execute, whatever they take in hand. Their fiſhing implements are much the ſame as in other iſlands: here was purchaſed a fiſh-net made like our caſting-nets, knit of very firm though ſlender threads.

Notwithſtanding their very friendly diſpoſition, theſe people have very formidable weapons; ſome of their ſpears have many barbs, and muſt be very dangerous weapons when they take effect. A large flat ſhell or breaſt-plate was purchaſed, made of a roundiſh bone, white and poliſhed like ivory, about 18 inches in diameter, which appeared to have belonged to an animal of the whale tribe.

Amulet.

AMULET, a charm, or preſervative againſt miſchief, witchcraft, or diſeaſes.

Amulets were made of ſtone, metals, ſimples, animals, in a word, of every thing that imagination ſuggeſted.

Sometimes they conſiſted of words, characters, and ſentences, ranged in a particular order, and engraved upon wood, *&c.* and worn about the neck, or ſome other part of the body. See ABRACADABRA.

At other times they were neither written nor engraved; but prepared with many ſuperſtitious ceremonies, great regard being uſually paid to the influence of the ſtars. The Arabians have given to this ſpecies of amulet the name of TALISMAN.

All nations have been fond of amulets: the Jews were extremely ſuperſtitious in the uſe of them, to drive away diſeaſes; and the Miſna forbids them, unleſs received from an approved man who had cured at leaſt three perſons before by the ſame means.

Among the Chriſtians of the early times, amulets were made of the wood of the croſs, or ribbands with a text of ſcripture written in them, as preſervatives againſt diſeaſes. Notwithſtanding the progreſs of learning and refinement, there is not any country in Europe, even at this day, who do not believe in ſome charm or other. The pope is ſuppoſed to have the virtue of making amulets, which he exerciſes in the conſecrating of *Agnus Dei's*, &c. The ſpunge which has wiped his table, was formerly in great veneration as a preſervative from wounds, and from death itſelf: on this account it was ſent with great ſolemnity by Gregory II. to the duke of Aquitain.

Amulets are now much fallen from the repute they were anciently in: yet the great Mr Boyle alleges them as an inſtance of the increaſe of external effluvia into the habit, in order to ſhow the great poroſity of the human body. He adds, that he is perſuaded ſome of theſe external medicines do anſwer; for that he himſelf, having once been ſubject to bleed at the noſe, and reduced to uſe ſeveral remedies to check it, found the moſs of a dead man's ſkull, though only applied ſo as to touch the ſkin till the moſs was warm thereby, the moſt effectual of any. The ſame Mr Boyle ſhows how the effluvia, even of cold amulets, may, in tract of time, pervade the pores of a living animal; by ſuppoſing an agreement between the pores of the ſkin and the figure of the corpuſcles. Bellini has demonſtrated the poſſibility of the thing in his laſt propoſitions *De Febribus;* and the like is done by Dr. Wainright, Dr Keill, &c.

AMURAT, or Amurath, I. the fourth emperor of the Turks, and one of the greateſt princes of the Ottoman empire, ſucceeded Solyman in 1360. He took from the Greeks, Gallipoli, Thrace, and Adrianople, which laſt he choſe for the place of his reſidence. He defeated the prince of Bulgaria, conquered Miſnia, chaſtiſed his rebellious baſhaws, and is ſaid to have gained 36 battles. This prince, in order to form a body of devoted troops that might ſerve as the immediate guards of his perſon and dignity, appointed his officers to ſeize annually, as the imperial property, the fifth part of the Chriſtian youth taken in war. Theſe, after being inſtructed in the Mahometan religion, inured to obedience by ſevere diſcipline, and trained to warlike exerciſes, were formed into a body diſtinguiſhed by the name of *Janiſſaries*, or *New Soldiers*. Every ſentiment which enthuſiaſm can inſpire, every mark of diſtinction that the favour of the prince could confer, were employed in order to animate this body with martial ardour, and with a conſciouſneſs of its own preeminence. The Janiſſaries ſoon became the chief ſtrength and pride of the Ottoman armies, and were diſtinguiſhed above all the troops whoſe duty it was to attend on the perſon of the Sultan.—At length the death of Lazarus, deſpot of Servia, who had endeavoured in vain to ſtop the progreſs of Amurat's arms, touched Milo, one of his ſervants, in ſo ſenſible a manner, that, in revenge, he ſtabbed the ſultan in the midſt of his troops, and killed him upon the ſpot, A. D. 1389, after he had reigned 23 years.

Amurat II. the 10th emperor of the Turks, was the eldeſt ſon of Mahomet I. and ſucceeded his father in 1421. He beſieged Conſtantinople and Belgrade without ſucceſs; but he took Theſſalonica from the Venetians, and compelled the prince of Boſnia and John Caſtriot prince of Albany to pay him tribute. He obliged the latter to ſend his three ſons as hoſtages; among whom was George, celebrated in hiſtory by the name of *Scanderbeg*. John Hunniades defeated Amurat's troops, and obliged him to make peace with the Chriſtian princes, in 1442. Theſe princes afterwards breaking the peace, Amurat defeated them in the famous battle of Varna, November 10th, 1444, which proved ſo fatal to the Chriſtians, and in which Ladiſlaus king of Hungary was killed. He afterwards defeated Hunniades, and killed above 20,000 of his men; but George Caſtriot, better known by the name of *Scanderbeg*, being re-eſtabliſhed in the eſtates of his father, defeated the Turks ſeveral times, and obliged Amurat to raiſe the ſiege of Croia, the capital of Albany. Amurat died, chagrined with his ill ſucceſs, and infirm with age, February 11th, 1451, at Adrianople. It is obſerved to this prince's honour, that he always kept his treaties with the greateſt fidelity.

AMYCLÆ, a city of Laconia, diſtant about 18 miles from the metropolis, founded by Amyclas the ſon of Lacedæmon, and famed afterwards for the birth of Caſtor and Pollux the ſons of Tydareus, eighth king of Sparta. It was afterwards famed for ſending a conſiderable colony of its own inhabitants into Upper Calabria, who built there a city which they called by the ſame name. This laſt city was ſituated between Caieta and Terracina, and gives its name to the neighbouring ſea. According to Pliny and Solinus, the territory of Amyclæ was ſo infeſted with vipers and other ſerpents, that the inhabitants were obliged to abandon their dwellings and ſettle elſewhere.—Among the ancient poets, the Amycli, or inhabitants of this city, obtained the epithet of *taciti* or *ſilent*. The reaſon of this was, either becauſe it was built by the Lacedæmonians, who, as they followed the doctrine of Pythagoras, were always inculcating the precept of ſilence, and thence called *taciti:* or becauſe of a law which obtained in this place, forbidding any one, under ſevere penalties, to mention the approach of an enemy. Before this law was made, the city was daily alarmed by falſe reports, as the enemy had been already at the gates. From terrors of this kind the abovementioned law indeed delivered them: but in the end it proved the ruin of the city: for the Dorians appearing unexpectedly under the walls, not one ventured to tranſgreſs the law; ſo that the city was eaſily taken. They reduced it to an inconſiderable hamlet; in which, however, were ſeen ſome of the remains of its ancient grandeur. One of the fineſt buildings that eſcaped the common ruin, was the temple and ſtatue of Alexandra, whom the inhabitants pretend to be the ſame with Caſſandra the daughter of Priam.

AMYGDALUS, the Almond and Peach: a genus of the monogynia order, belonging to the icoſandria claſs of plants; and, in the natural method, ranking under the 36th order, *Pomaceæ*. The characters are: The *calyx* is a ſingle-leaved perianthium beneath, tubular, and quinquefid: The *corolla* conſiſts of five oblong petals, which are inſerted into the calyx: The *ſtamina* conſiſt of 30 ſlender erect filaments, half the length of the corolla, and inſerted into the calyx; the antheræ are ſimple: The *piſtillum* has a round villous germen above; a ſimple ſtylus, the length of the ſtamina; and the ſtigma headed: The *pericarpium* is a large roundiſh villous drupa, with a longitudinal furrow: the ſeed is an ovate compreſſed nut, perforated in the pores.

Species. 1. The Communis, or Common Almond, a native of Africa, will grow to near 20 feet high; and where whether planted ſingly in an open place, or mixed with others in clumps, ſhrubbery-quarters, &c. ſhows itſelf one of the fineſt flowering trees in nature. Thoſe who never yet ſaw it, may eaſily conceive what a noble appearance this tree muſt make, when covered all over with a bloom of a delicate red, which will be in March; a time when very few trees are ornamented either with leaves or flowers. No ornamental plantations, therefore, of what ſort or kind ſoever, ſhould be without almond trees. Neither are the beauties of the flowers the only thing deſirable in this tree: The fruit would render it worthy of planting, were there no other motive. It ripens well, and its goodneſs is well known.—The white-flowering almond is a variety of this ſpecies, and is cultivated for the ſake of the flowers and the fruit, though the flowers are inferior to the others.

2. The Nana, Dwarf Almond, is a native of Aſia Minor. Of this ſhrub there are two ſorts, the ſingle and the double. Both grow to about four or five feet high, and are in the firſt eſteem as flowering ſhrubs. The ſingle ſort has its beauties; but the double kind is matchleſs. In both, the flowers are arranged the whole length of the laſt year's ſhoots; their colour is a delicate red; and they ſhow themſelves early in the ſpring, which ſtill enhances their value.

3. The Perſica, or Peach, is ſaid to be a native of Europe; but of what place is not known. Cultivation has produced many varieties of this fruit; of which the following are the moſt eſteemed.

1. The White Nutmeg.
2. The Red Nutmeg.
3. The Early Purple.
4. The Small Mignon.
5. The White Magdalen.
6. The Yellow Alberge.
7. The Large French Mignon.
8. The Beautiful Chevreuſe.
9. The Red Magdalen.
10. The Chancellor.
11. Smith's Newington.
12. The Montauban.
13. The Malta.
14. The Vineuſe.
15. The Bellegarde.
16. The Bourdine.
17. The Roſſanna.
18. The Admirable.
19. The Old Newington.
20. The Royal.
21. The Rambouillet.
22. The Portugal.
23. The Late Admirable.
24. The Nivette.
25. Venus's Nipple.
26. The Late Purple.
27. The Perſique.
28. The Catharine.
29. The Monſtrous Pavy.
30. The Bloody Peach.

The White Nutmeg is the firſt peach in ſeaſon, it being often in perfection by the end of July. The leaves are doubly ſerrated, the flower large, and of a pale colour; the fruit is white, ſmall, and round; the fleſh, too, is white, parts from the ſtone, and has a ſugary, muſky flavour.

The Red Nutmeg hath yellowiſh green leaves, with ſerpentine edges, which are ſlightly ſerrated. The flowers are large, open, and of a deep bluiſh-colour. The fruit is larger and rounder than the former, and is of a bright vermilion next the ſun, but more yellow on the other ſide. The fleſh is white, except next the ſtone, from which it ſeparates, and has a rich muſky flavour. It ripens juſt after the white nutmeg.

The Early Purple hath ſmooth leaves, terminated in a ſharp point. The flowers are large, open, and of a lively red. The fruit is large, round, and covered with a fine deep red coloured down. The fleſh is white, red next the ſtone, and full of a rich vinous juice. Ripe about the middle of Auguſt.

The Small Mignon hath leaves ſlightly ſerrated, and the flowers ſmall and contracted. The peach is round, of a middling ſize, tinged with darkiſh red on the ſunſide, and is of a pale yellowiſh colour on the other. The fleſh is white, parts from the ſtone, where it is red, and contains plenty of a vinous, ſugary juice. Ripens rather before the former.

The White Magdalen hath long, ſhining, pale-green leaves, deeply ſerrated on the edges, and the wood is moſtly black at the pith. The flowers are large and open, appear early, and are of a pale red. The fruit is round, rather large, of a yellowiſh-white colour, except on the ſunny ſide, where it is ſlightly ſtreaked with red. The fleſh is white to the ſtone, from which it ſeparates, and the juice is pretty well flavoured. Ripe at the end of Auguſt.

The Yellow Alberge hath deep red, middle-ſized flowers; the peach is ſmaller than the former, of a yellow colour on the ſhady ſide, and of a deep red on the other. The fleſh is yellow, red at the ſtone, and the juice is ſugary and vinous.

The Great French Mignon hath large, finely ſerrated leaves, and beautiful red flowers. The fruit is large, quite round, covered with a fine ſattiny down, of a browniſh red colour on the ſunny ſide, and of a greeniſh yellow on the other. The fleſh is white, eaſily parts from the ſkin, and is copiouſly ſtored with a ſugary high-flavoured juice. Ripe near the middle of Auguſt.

The Beautiful Chevreuſe hath plain leaves, and ſmall contracted flowers. The fruit is rather oblong, of a middling ſize, of a fine red colour next the ſun, but yellow on the other ſide. The fleſh is yellowiſh, parts from the ſtone, and is full of a rich ſugary juice. It ripens a little after the former.

The Red Magdalen hath deeply ſerrated leaves, and large open flowers. The fruit is large, round, and of a fine red next the ſun. The fleſh is firm, white, ſeparates from the ſtone, where it is very red; the juice is ſugary, and of an exquiſite rich flavour. Ripe at the end of Auguſt.

The Chancellor hath large, ſlightly ſerrated leaves. The peach is about the ſize of the Beautiful Chevreuſe, but rather rounder. The ſkin is very thin, of a fine red on the ſunny ſide; the fleſh is white and melting, parts from the ſtone, and the juice is very rich and ſugary. It ripens with the former.

The leaves of Smith's Newington are ſerrated, and the flowers are large and open. The fruit is of a middle ſize, of a fine red on the ſunny ſide; the fleſh white and firm, but very red at the ſtone, to which it ſticks cloſely, and the juice has a pretty good flavour. Ripens with the former.

The Montauban hath ſerrated leaves, and large open flowers. The fruit is about the ſize of the former, of a purpliſh red next the ſun, but of a pale one on the ſhady ſide. The fleſh is melting, and white even to the ſtone, from which it ſeparates. The juice is rich, and well flavoured. It ripens a little before the former.

The Malta hath deeply ſerrated leaves, and the flowers are large and open. The fruit is almoſt round, of a fine red next the ſun, marbled with a deeper red, but the ſhady ſide is of a deep green. The fleſh is fine, white, except at the ſtone, from which it parts, where it is of a deep red; the juice is a little muſky, and agreeable. It ripens at the end of Auguſt, or beginning of September.

The Vineuſe hath large deep green leaves, and full bright red flowers. The fruit is round, of a middle ſize; the ſkin is thin, all over red; the fleſh fine and white, except at the ſtone, where it is very red, and the juice is copious and vinous. Ripe in the middle of September.

The Bellegarde hath ſmooth leaves, and ſmall contracted flowers. The fruit is very large, round, and of a deep purple colour next the ſun. The fleſh is white, parts from the ſtone, where it is of a deep red, and the juice is rich and excellent. It ripens early in September.

The Bourdine hath large, fine green, plain leaves, and ſmall fleſh-coloured contracted flowers. The fruit is round, of a dark red next the ſun; the fleſh white, except at the ſtone, where it is of a deep red, and the juice is rich and vinous. Ripens with the former.

The Roſſanna hath plain leaves, and ſmall contracted flowers. The fruit is rather longer than the alberge, and ſome count it only a variety of the latter. The fleſh is yellow, and parts from the ſtone, where it is red; the juice is rich and vinous. Ripe early in September.

The Admirable hath plain leaves, and ſmall contracted flowers, which are of a pale red. The fruit is very large and round; the fleſh is firm, melting, and white, parts from the ſtone, and is there red; and the juice has a ſweet, ſugary, high vinous flavour. Ripe early in September.

The Old Newington hath ſerrated leaves, and large open flowers. The fruit is large, of a fine red next the ſun; the fleſh is white, ſticks cloſe to the ſtone, where it is of a deep red, and the juice has an excellent flavour. It ripens juſt after the former.

The Royal hath plain leaves, and ſmall contracted flowers. The fruit is about the ſize of the admirable, and reſembles it, except that it has ſometimes a few knobs or warts. The fleſh is white, melting, and full of a rich juice; it parts from the ſtone, and is there of a deep red. Ripe about the middle of September.

The Rambouillet hath leaves and flowers like the royal. The fruit is rather round than long, of a middling ſize, and deeply divided by a furrow. It is of a bright yellow on the ſhady ſide, but of a fine red on the other. The fleſh is melting, yellow, parts from the ſtone, where it is of a deep red, and the juice is rich and vinous. Ripe with the former.

The Portugal hath plain leaves, and large open flowers. The fruit is large, ſpotted, and of a beautiful red on the ſunny ſide. The fleſh is firm, white, ſticks to the ſtone, and is there red. The ſtone is ſmall, deeply furrowed, and the juice is rich and ſugary. Ripe towards the end of September.

The Late Admirable hath ſerrated leaves, and browniſh red ſmall contracted flowers. The fruit is rather large and round, of a bright red next the ſun, marbled with a deeper. The fleſh is of a greeniſh-white, and ſticks to the ſtone, where it hath ſeveral red veins; the juice is rich and vinous. Ripe about the middle of September.

The Nivette hath ſerrated leaves, and ſmall contracted flowers. The fruit is large and roundiſh, of a bright red colour next the ſun, but of a pale yellow on the ſhady-ſide. The fleſh is of a greeniſh-yellow, parts from the ſtone, where it is very red, and is copiouſly ſtored with a rich juice. It ripens about the middle of September.

Venus's Nipple hath finely ſerrated leaves, and roſe-coloured, ſmall contracted flowers, edged with carmine. The fruit is of a middling ſize, and has a riſing like a breaſt. It is of a faint red on the ſunny-ſide, and on the ſhady one of a ſtraw-colour. The fleſh is melting, white, ſeparates from the ſtone, where it is red, and the juice is rich and ſugary. Ripens late in September.

The Late Purple hath large, ſerrated leaves, which are variouſly contorted, and the flowers are ſmall and contracted. The fruit is round, large, of a dark red on the ſunny-ſide, and yellowiſh on the other. The fleſh is melting, white, parts from the ſtone, where it is red, and the juice is ſweet and high-flavoured. Ripens with the former.

The Perſique hath large, very long indented leaves, and ſmall contracted flowers. The fruit is large, oblong, of a fine red next the ſun; the fleſh firm, white, but red at the ſtone, juicy, and of a high pleaſant flavour. The ſtalk has frequently a ſmall knot upon it. Ripe late in September.

The Catharine hath plain leaves, and ſmall flowers. The fruit is large, round, of a very dark red next the ſun. The fleſh white, firm, ſticks cloſe to the ſtone, and is there of a deep red. The juice is rich and pleaſant. It ripens early in October.

The Monſtrous Pavy hath large, very ſlightly ſerrated leaves, and large, but rather contracted flowers. The fruit is round, and very large, whence its name. It is of a fine red on the ſunny-ſide, and of a greeniſh-white on the other. The fleſh is white, melting, ſticks cloſe to the ſtone, and is there of a deep red. It is pretty full of juice, which in dry ſeaſons is ſugary, vinous, and agreeable. Ripe towards the end of October.

The Bloody Peach hath rather large, ſerrated leaves, which turn red in autumn. The fruit is of a middling ſize, the ſkin all over of a dull red, and the fleſh is red down to the ſtone. The fruit is but dry, and the juice rather ſharp and bitteriſh. It is well worth cultivating notwithſtanding, for the fruit bake and preſerve extremely well.

The peach-tree has hitherto been planted againſt walls for the ſake of the fruit: “ but, (ſays Hanbury), as I hardly ever knew a perſon who was not ſtruck with the beauty of the flowers when in full blow againſt a wall, why ſhould it not have a ſhare in wilderneſs-quarters and ſhrubberies, amonſt the ſorts of almonds, &c.? It may be kept down, or permitted to grow to the height of the owner's fancy: and the flowers are inferior to none of the other ſorts. Add to this, they frequently, in well-ſheltered places, produce fruit which will be exceeding well-flavoured; and thus the owner may enjoy the benefit of a double treat.” The above obſervations reſpect the ſingle peach; with regard to the double-flowered, it is generaly propagated for ornamental plantations, and is univerſally acknowledged to be one of the fineſt flowering-trees yet known. Againſt a wall, however, theſe trees are always the faireſt; and if they have this advantage, they are ſucceeded by very good fruit.

The NECTARINE, according to Linnæus, is only a variety of the peach, its having a ſmooth coat being only an accident originally. Of this alſo many varieties are now cultivated; and the following are ſome of the moſt eſteemed: 1. The Elruge. 2. The Newington. 3. The Scarlet. 4. The Roman. 5. The Murrey. 6. The Italian. 7. The Golden. 8. The Temple's.

The Elruge hath large ſerrated leaves, and ſmall flowers. The fruit is of a middling ſize, of a dark purple colour next the ſun, and of a greeniſh yellow on the ſhady ſide. The fleſh parts from the ſtone, and has a ſoft, melting, good flavoured juice. Ripe early in Auguſt.

The Newington hath ſerrated leaves, and large open flowers. The fruit is pretty large, of a beautiful red on the ſunny-ſide, but of a bright yellow on the other. The fleſh ſticks to the ſtone, is there of a deep red colour, and the juice has an excellent rich flavour. Ripe towards the end of Auguſt.

The ſcarlet is rather leſs than the former, of a fine ſcarlet colour next the ſun, but fades to a pale red on the ſhady ſide. It ripens near the time of the former.

The Roman, or cluſter red nectarine, hath plain leaves, and large flowers. The fruit is large, of a deep red towards the ſun, but yellowiſh on the ſhady ſide. The fleſh is firm, ſticks to the ſtone, and is there red; the juice is rich, and has an excellent flavour. Ripe about the end of Auguſt.

The Murrey is a middling-ſized fruit, of a dirty red colour on the ſunny ſide, and yellowiſh on the ſhady one. The fleſh is firm, and tolerably well flavoured. It ripens early in September.

The Italian Nectarine hath ſmooth leaves and ſmall flowers; the fruit is red next the ſun, but yellowiſh on the other ſide; fleſh firm, adheres to the ſtone, where it is red, and when ripe, which is early in September, has an excellent flavour.

The Golden Nectarine has an agreeable red colour next the ſun, bright yellow on the oppoſite ſide; fleſh very yellow, ſticks to the ſtone, where it is of a pale red, has a rich flavour, and ripens in September.

Temple's Nectarine is of a middling ſize, of a fair red next the ſun, of a yellowiſh green on the other ſide; fleſh white near the ſtone, from which it ſeparates; ripens in September, and has a high poignant flavour.

Propagation, &c. All the above ſpecies are propagated by inoculating them into plum-ſtocks in Auguſt. The ſtocks ſhould be firſt planted in the nurſery when of the ſize of a ſtraw; and the firſt or ſecond ſummer after they will be ready to receive the bud. The uſual method of inoculation muſt be obſerved, and there is no danger of ſucceſs; though it may be proper to obſerve, that the double-bloſſomed peach ſhould always be worked into the ſtocks of the muſſel-plum. The two ſorts of dwarf-almond may alſo be propagated by layers, or from the ſuckers, which they ſometimes ſend forth in great plenty.

The varieties of the peach are produced like thoſe of the finer flowers, by ſowing the ſeeds; and though many raiſed this way will be of little value, as is alſo the caſe of flowers, yet probably among a parcel of ſtones, ſaved from the finer kinds of peaches, there would be ſome new kinds produced. The beſt method of ſaving the ſtones is, to let ſome of the fineſt peaches of the beſt kinds hang till they drop of themſelves from the tree, and then the ſtones ſhould be immediately planted on a bed of light dry earth, planting them about three inches deep in the earth, and at about four inches aſunder. The beds ſhould be covered to preſerve them in the winter; and in ſpring, when the plants come up, they muſt be cleared of weeds, and well watered. The next ſpring they ſhould be carefully taken up, and planted in the nurſery, in rows three feet aſunder, and one foot diſtant from each other; laying a little mulch upon the ſurface of the ground about their roots, and in a dry ſpring watering them once a week; and after one or two years ſtanding here, they may be removed to the place where they are to remain; or they may, at that time, when the condition of their fruit is known, be grafted on other ſtocks.

There are two general rules given for the pruning of peach and nectarine trees; viz. 1. Always to have enough of bearing wood; And, 2. Not to lay in the branches too cloſe to one another. All peach trees produce their fruit from the young wood either of the ſame, or at the moſt of the former year's ſhoot; for which reaſon the branches are to be ſo pruned, as to encourage them to throw out new ſhoots in every part of the tree: and this is to be done in May; when by pinching, or ſtopping the ſtrong ſhoots, there may be new wood forced out in any part of the tree. This is the method of the ſummer pruning: the winter pruning is uſually done in February or March; but is much better done at Michaelmas, as ſoon as their leaves begin to fall; and the wounds will then have time to heal before the ſevere froſts come on.

In pruning of theſe trees it muſt always be obſerved alſo, that it is beſt done under a wood bud, not a bloſſom bud; which may be diſtinguiſhed by the wood bud's being leſs turgid, and longer and narrower than the bloſſom bud; for if the ſhoot have not a leading bud where it is cut, it will commonly die down to the leading bud. In nailing the ſhoots to the wall, they ſhould be placed at as equal diſtances as poſſible; and ſo far apart that the leaves may have room; and they muſt always be trained as horizontally as poſſible, that the lower part of the tree may be well wooded, which it will not be if the branches are ſuffered to run upright. When the fruit is ſet and grown to the ſize of a ſmall nut, it ſhould be thinned, and left five or ſix inches aſunder: by this management the fruit will be larger and better taſted, and the trees in a condition to bear well the ſucceeding year. The quantity of fruit to be left on large full grown trees ſhould never be greater than five dozen upon each; but on middling trees, three or four dozen will be enough. If the ſeaſon ſhould prove hot and dry, it will be proper to draw up the earth round the ſtem of each tree, to form a hollow baſon of about ſix feet in diameter, and cover the ſurface of the ground in this baſon with mulch; and once in a week or fortnight, according to the drought of the ſeaſon, to pour down eight or ten gallons of water to the root of each tree; or the water may be ſprinkled by an engine over the branches of the trees, which, ſhaking down to the roots, will promote the growth of the fruit and prevent its falling off the trees. This, however, ſhould be continued only while the fruit is growing.

The peach-tree, as well as the roſe-tree, are very ſubject

ject to be over-run with the aphides; which may be deſtroyed by fumigating the houſe in which the plants are kept with tobacco, or, which is ſaid to be the moſt effectual method, by ſteam raiſed from water poured over the flues *.—Soap-ſuds are ſaid to deſtroy effectually the different ſpecies of inſects that infeſt fruit-trees growing againſt walls, and particularly the peach, cherry, and plum. For this purpoſe, a perſon on a ladder ſhould pour them from a watering-pot over both trees and wall, beginning at the top of the wall, and bringing it on in courſes from top to bottom. The ſuds contribute likewiſe, it is ſaid, to preſerve the wood of the delicate and tender kinds of peaches.

Uſes. Sweet almonds are reckoned to afford little nouriſhment; and, when eaten in ſubſtance, are not eaſy of digeſtion, unleſs thoroughly comminuted: Peeled, and eaten ſix or eight at a time, they ſometimes give preſent relief in the heart-burn. But in medicine they are moſtly uſed for making emulſions; and they abound not only with an oil, but likewiſe with a mucilage fit for incorporating oil and water together.

Emulſions are commonly prepared from almonds, by beating an ounce of them, after being blanched, into a fine pulp, in a marble or ſtone mortar; and triturating them well with half an ounce (more or leſs) of fine ſugar; and then adding by little at a time, a quart of water; taking care to continue grinding them while the water is poured on; after which the white milky liquor is ſtrained through a cloth, and put into a quart bottle. Some people add a dram of blanched bitter almonds to an ounce of the ſweet, which they think make the emulſions more agreeable. Such emulſions have been much uſed as drink in acute diſeaſes, for diluting and blunting acrimonious juices in the firſt paſſages, and acrid ſaline particles in the blood; and for ſoftening and lubricating the fibres and membranes.

It has been a common practice to diſſolve from half an ounce to an ounce, or more, of gum-arabic in the water uſed for making the emulſions; and to make patients drink freely of them, while bliſters are applied to the body, in order to prevent ſtrangury; and to order them to be uſed in caſes of gravel, and of inflammation of the bladder or urethra; and in heat of urine from virulent gonorrhœa or other cauſes.

Camphor, reſin of jalap, and other reſinous ſubſtances, by being triturated with almonds, become miſcible with water, and more mild and pleaſant than they were before; and therefore they are frequently ordered to be rubbed with them, and made up into pills or boluſes, with the addition of ſome conſerve or gum-arabic mucilage; or they are incorporated with watery liquors into the form of an emulſion.

Formerly the ſeeds of the lettuce, of the cucumber, of the white poppy, and of a number of other plants, were employed for making emulſions; but now the ſweet almonds ſupply the place of all the reſt.

The bitter almonds are not ſo much uſed as they were formerly; becauſe they have been found to deſtroy ſome ſorts of animals: this effect was related by the ancients, but believed to be fictitious; becauſe when eaten by men they appear to be innocent, and to produce no deleterious effects. However, the facts related by Wepſer in his Treatiſe *de Cicuta Aquatica*, having been confirmed by latter experiments; and it having been diſcovered that a water drawn from them had deleterious effects, and that the diſtilled water from the lauro-ceraſus leaves, which have a bitter taſte reſembling that of bitter almonds, was ſtill more poiſonous; it raiſed a ſuſpicion of the wholeſomeneſs of thoſe bitter ſubſtances, and has made phyſicians more cautious of uſing them, though they have been employed for making orgeate and other liquors, without producing any bad effects.

As to the peach and nectarine, they are ſufficiently known as delicious fruits. Peach-flowers have an agreeable ſmell, and a bitteriſh taſte: diſtilled, without any addition, by the heat of a water-bath, they yield one-ſixth their weight, or more, of a whitiſh liquor, which, as Mr Bolduc obſerves, communicates to a large quantity of other liquids a flavour like that of the kernels of fruits. An infuſion in water of half an ounce of the freſh-gathered flowers, or a dram of them when dried, ſweetened with ſugar, proves for children an uſeful laxative and anthelmintic: the leaves of the tree are, with this intention, ſomewhat more efficacious, though leſs agreeable. The fruit has the ſame quality with the other ſweet fruits, that of abating heat, quenching thirſt, and gently looſening the belly.

AMYLACEOUS, from *amylum* "ſtarch;" a term applied to the fine flour of farinaceous ſeeds, in which conſiſts their nutritive part. See Bread.

AMYNTA, in literary hiſtory, a beautiful paſtoral comedy, compoſed by Taſſo; the model of all dramatic pieces wherein ſhepherds are actors. The *Paſtor Fido*, and *Filli di Sciro*, are only copies of this excellent piece.

AMYNTOR, αμυντωρ, formed of the verb αμυνώ, *I defend*, or *avenge*, properly denotes a perſon who defends or vindicates a cauſe. In this ſenſe, Mr Toland intitles his defence of Milton's life, *Amyntor*, as being a vindication of that work againſt Mr Blackhall and others, who had charged him with queſtioning the authority of ſome of the books of the New Teſtament, and declaring his doubt that ſeveral pieces under the name of Chriſt and his apoſtles, received now by the whole Chriſtian church, were ſuppoſititious.

AMYOT (James), biſhop of Auxerre and great almoner of France, was born of an obſcure family at Melun, the 30th of October 1514, and ſtudied philoſophy at Paris, in the college of Cardinal Le Moine. He was naturally dull and heavy; but diligence and application made amends for theſe natural defects. He left Paris at the age of twenty-three; and went to Bourges with the Sieur Colin, who had the abbey of St Ambroſe in that city. At the recommendation of this abbot, a ſecretary of ſtate took Amyot into his houſe to be tutor to his children. The great improvements they made under his direction induced the ſecretary to recommend him to the princeſs Margaret ducheſs of Berry, only ſiſter of Francis I. and by means of this recommendation Amyot was made public profeſſor of Greek and Latin in the univerſity of Bourges. It was during this time he tranſlated into French the "Amours of Theagines and Chariclea," which Francis I. was ſo pleaſed with, that he conferred upon him the abbey of Belloſane. He alſo tranſlated Plutarch's Lives, which he dedicated to the king; and afterwards undertook that of Plutarch's Morals, which he ended in the reign of Charles IX. and dedicated to that prince. Charles conferred upon him the abbey of St Cornelius de Compiegne, and made him great almoner of France and biſhop of Auxerre. He died in 1593, aged 79.

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* See *Kyle on forcing Peaches.*

AMYRALDISM, a name given by ſome writers to the doctrine of univerſal grace, as explained and aſſerted by Amyraldus, or Moſes Amyrault, and others his followers, among the reformed in France, towards the middle of the 17th century.

This doctrine principally conſiſted of the following particulars, viz. that God *deſires* the happineſs of all men, and none are excluded by a divine decree; that none can obtain ſalvation without faith in Chriſt; that God refuſes to none the *power* of *believing*, though he does not grant to *all* his aſſiſtance, that they may improve this power to ſaving purpoſes; and that many periſh through their own fault. Thoſe who embraced this doctrine were called *Univerſaliſts*; though it is evident they rendered grace *univerſal* in words, but *partial* in reality, and are chargeable with greater inconſiſtences than the *Supralapſarians*.

AMYRAULT (Moſes), an eminent French Proteſtant divine, born at Bourgueil in Touraine in 1596. He ſtudied at Saumur, where he was choſen profeſſor of theology; and his learned works gained him the eſteem of Catholics as well as Proteſtants, particularly of Cardinal Richelieu, who conſulted him on a plan of re-uniting their churches, which, however, as may well be ſuppoſed, came to nothing. He publiſhed a piece in which he attempted to explain the myſtery of predeſtination and grace, which occaſioned a controverſy between him and ſome other divines. He alſo wrote, An Apology for the Proteſtants; a Paraphraſe on the New Teſtament; and ſeveral other books. This eminent divine died in 1664.

PlateXVII.

AMYRIS: A genus of the monogynia order, belonging to the decandria claſs of plants. The characters are: The *calyx* is a ſmall ſingle-leaved perianthium, four-toothed and perſiſtent: The *corolla* conſiſts of four oblong petals, concave and expanding: The *ſtamina* conſiſt of eight erect ſubulated filaments; the antheræ are oblong, erect, and the length of the corolla: The *piſtillum* has an ovate germen, above; a thickiſh ſtylus, the length of the ſtamina; and a four-cornered ſtigma: The *pericarpium* is a round drupaceous berry: The *ſeed* is a globular gloſſy nut.—The moſt remarkable ſpecies are: 1. The elemifera, or ſhrub which bears the gum-elemi, a native of South-America. It grows to the height of about ſix feet, producing trifoliated ſtiff ſhining leaves, growing oppoſite to one another on footſtalks two inches long. At the ends of the branches grow four or five ſlender ſtalks ſet with many very ſmall white flowers. 2. The gileadenſis, or opobalſamum, is an evergreen ſhrub, growing ſpontaneouſly in Arabia-Felix, from whence the opobalſam, or balm of gilead, is procured. 3. Toxifera, or poiſon-wood, is a ſmall tree, with a ſmooth light-coloured bark. Its leaves are winged; the middle rib is ſeven or eight inches long, with pairs of pinnæ one againſt another on inch-long footſtalks. The fruit hangs in bunches, is ſhaped like a pear, and is of a purple colour, covering an oblong hard ſtone. From the trunk of this tree diſtils a liquid as black as ink. Birds feed on the fruit: particularly one, called the *purple groſsbeak*, on the mucilage that covers the ſtone. It grows uſually on rocks, in Providence, Ilathera, and others of the Bahama iſlands. 4. The balſamifera, or roſe-wood, is found on gravelly hills in Jamaica and others of the Weſt India iſlands. It riſes to a conſiderable height, and the trunks are remarkable for having large protuberances on them. The leaves are laurel-ſhaped; the ſmall blue flowers are on a branched ſpike; and the berries are ſmall and black.

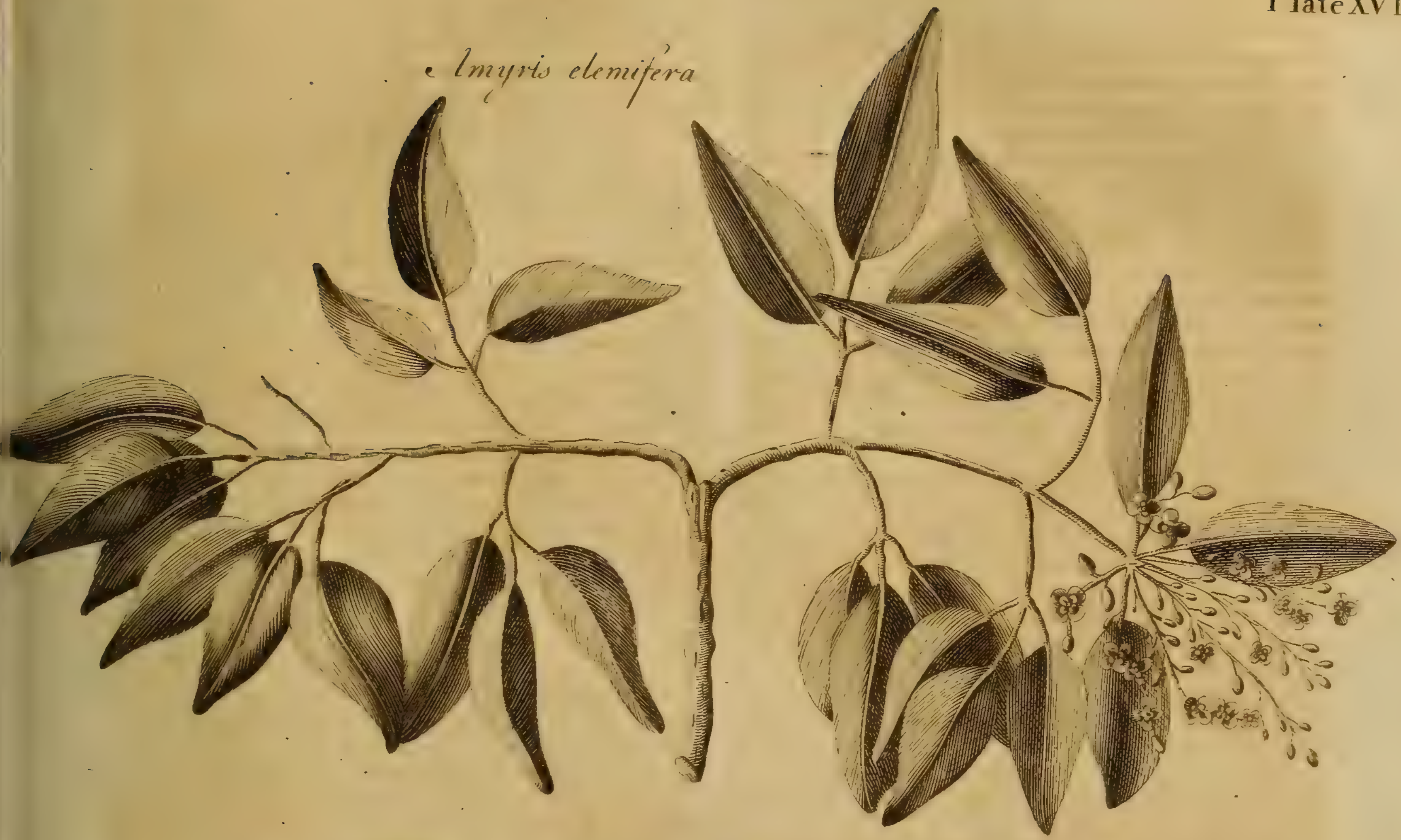
Properties. From the firſt ſpecies, which is called by the natives of the Braſils *icicariba*, is obtained the reſin improperly called *gum-elemi*, or gum-lemon. This drug is brought to us from the Spaniſh Weſt Indies, and ſometimes from the Eaſt Indies, in long roundiſh cakes, generally wrapped up in flag leaves. The beſt ſort is ſoftiſh, ſomewhat tranſparent, of a pale whitiſh yellow colour, inclining a little to green, of a ſtrong not unpleaſant ſmell. It almoſt totally diſſolves in pure ſpirit, and ſends over ſome part of its fragrance along with this menſtruum in diſtillation: diſtilled with water, it yields a conſiderable quantity of pale-coloured, thin, fragrant, eſſential oil. This reſin gives name to one of the officinal unguents, and is at preſent ſcarce any otherwiſe made uſe of; though it is certainly preferable, for internal purpoſes, to ſome others which are held in greater eſteem. The ſecond ſpecies yields the balſam of Mecca, of Syria, or of Gilead, which is the moſt fragrant and pleaſant of any of the balſams. The true balſam tree is found near to Mecca, which is ſituated about a day's journey from the Red Sea, on the Aſiatic ſide. It has a yellowiſh or greeniſh yellow colour, a warm bitteriſh aromatic taſte, and an acidulous fragrant ſmell. It has long been held in great eſteem. The Turks, who are in poſſeſſion of the country in which it grows, value it much as an odoriferous unguent and coſmetic, and ſet ſuch a high price upon it, that it is adulterated when it comes into the hands of the dealers, ſo that it is very difficult to get genuine ſpecimens of it. It has been recommended in great variety of complaints; but now it is generally believed that the Canada and copiava balſams are equally efficacious, and will anſwer every purpoſe for which it can be uſed. Dr Alſton ſays, that the ſureſt mark of this balſam being pure and unadulterated is, its ſpreading quickly on the ſurface of water when dropped into it; and that if a ſingle drop of it is let fall into a large ſaucer full of water, it immediately ſpreads all over its ſurface, and as it were diſſolves and diſappears; but in about half an hour it becomes a tranſparent pellicle covering the whole ſurface, and may be taken up with a pin, having loſt both its fluidity and colour, and become white and ſoft, cohering, and communicating its ſmell and taſte to the water. This teſt, he ſays, all the balſam he ſaw in Holland bore, though it is rare to get any from London that anſwers it. The balſamifera, or roſe-wood, affords an excellent timber; it is alſo replete with a fragrant balſam or oil, and retains its flavour and ſolidity through expoſed to the weather many years. By ſubjecting this wood to diſtillation, Dr Wright thinks, a perfume equal to the oleum rhodii may probably be obtained.

ANA, among phyſicians, denotes a quantity equal to that of the preceding ingredient. It is abbreviated thus, āā, or ā.

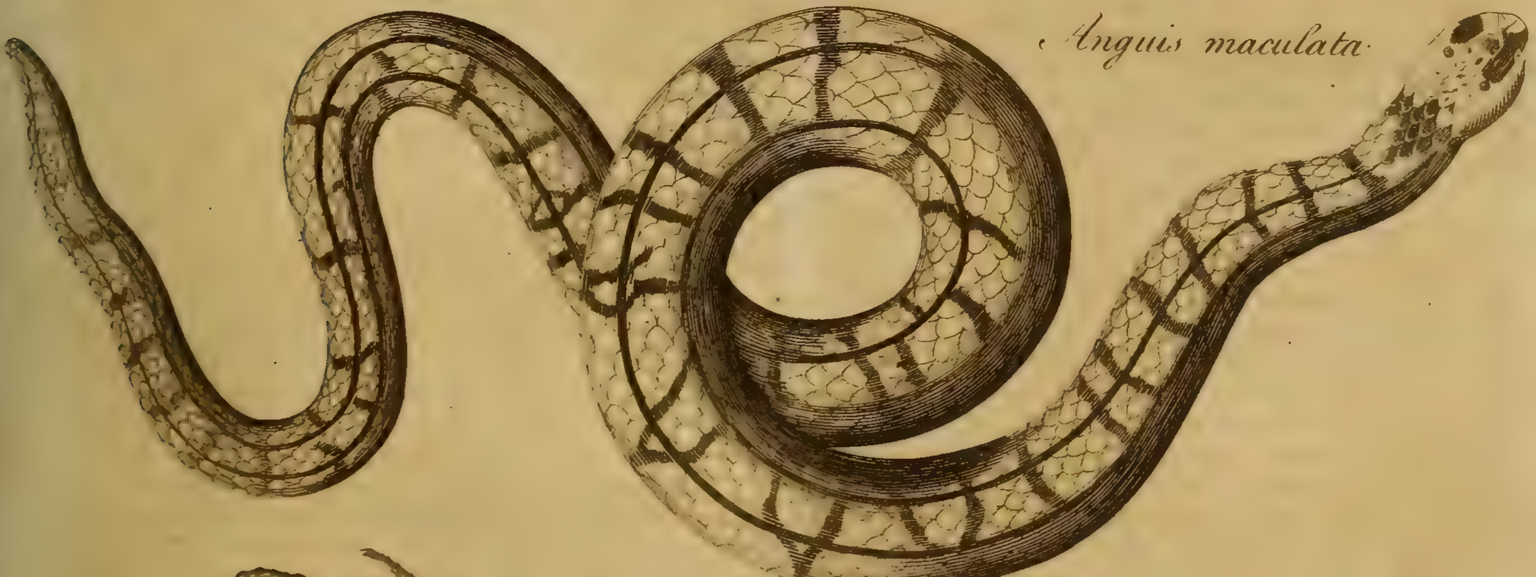
ANA, in matters of literature, a Latin termination, adopted into the titles of ſeveral books in other languages.—

Plate XVII

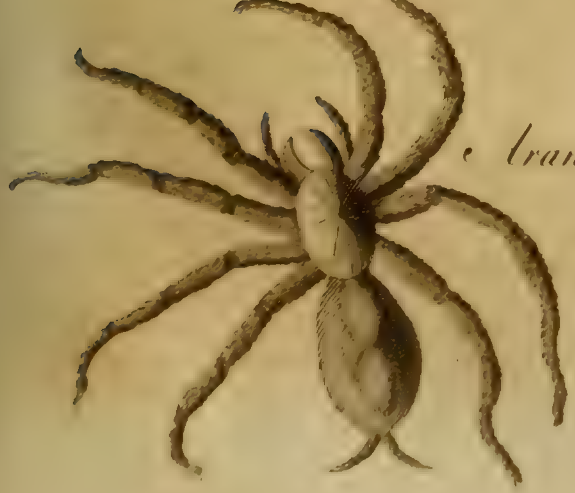
Amyris elemifera



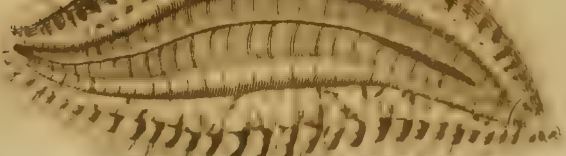
Anguis maculata



Aranea tarantula



Aphrodita



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guages.—*Anas*, or *books in ana*, are collections of the memorable ſayings of perſons of learning and wit; much the ſame with what we otherwiſe call *table-talk*.

Wolfius has given the hiſtory of books in ana, in the preface to the Caſauboniana. He there obſerves, that though ſuch titles be new, the thing itſelf is very old; that Xenophon's books of the deeds and ſayings of Socrates, as well as the dialogues of Plato, are *Socratiana*; that the apophthegms of the philoſophers collected by Diogenes Laertius, the ſentences of Pythagoras and thoſe of Epictetus, the works of Athenæus, Stobeus, and divers others, are ſo many anas. Even the Gemara of the Jews, with ſeveral other oriental writings, according to Wolfius, properly belong to the ſame claſs. To this head of ana may likewiſe be referred the Orphica, the Pythagoræa, Æſopica, Pyrrhonea, &c.

Scaligerana was the firſt piece that appeared with a title in ana. It was compoſed by Iſan de Vaſſan, a young Champanois, recommended to Joſ. Scaliger by Caſaubon. Being much with Scaliger, who was daily viſited by the men of learning at Leyden, De Vaſſan wrote down whatever things of any moment he heard Scaliger ſay. And thus aroſe the Scaligerana, which was not printed till many years after, at Geneva, in 1666. Patin. Let. 431.—Soon after came the Perroniana, Thuana, Naudæana, Patineana, Sorberiana, Menagiana, Anti-Menagiana, Furitiana, Chevræana, Leibnitziana, Arlequiniana, Poggiana, &c.

ANABAPTISTON, the ſame with ABAPTISTON.

ANABAPTISTS, a name which has been indiſcriminately applied to Chriſtians of very different principles and practices; though many of them object to the denomination, and hold nothing in common, beſides the opinion that baptiſm ought always to be performed by immerſion, and not adminiſtered before the age of diſcretion.

The word Anabaptiſt is compounded of ανα, "new," and βαπτιςης, "a baptiſt;" and in this ſenſe the Novatians, the Cataphrygians, and the Donatiſts, may be conſidered as a kind of Anabaptiſts in the earlier ages, though not then denoted by this name; for they contended, that thoſe Chriſtians of the Catholic church who joined themſelves to their reſpective parties ſhould be rebaptized. But we muſt not claſs under the ſame denomination thoſe biſhops of Aſia and Africa, who, in the third century, maintained, that baptiſm adminiſtered by thoſe whom they called heretics was not valid, and therefore that ſuch of them as returned into their churches ought to be rebaptized. Nor do the Engliſh and Dutch Baptiſts conſider the Denomination as at all applicable to their ſect: by whom the baptiſm appointed by Chriſt is held to be "nothing ſhort of *immerſion, upon a perſonal profeſſion of faith;*" of which profeſſion infants being incapable, and ſprinkling being no adequate ſymbol of the thing intended, the baptizing of proſelytes to their communion, who in their infancy had undergone the ceremony of ſprinkling, cannot, it is urged, be interpreted a repetition of the baptiſmal ordinance.

Anabaptiſts, in a ſtrict and proper ſenſe, appear to be thoſe who not only rebaptize, when they arrive at an adult age, perſons that were baptized in their infancy, but alſo, as often as any perſon comes from one of their ſects to another, or as often as any one is excluded from their communion and again received into the boſom of their church, they baptize him. And ſuch were many of the German Baptiſts. But the ſingle opinion common to all the ſects to which the name of *Anabaptiſts* has been indiſcriminately applied, is that of the invalidity of *infant baptiſm*, in whatever way adminiſtered: And hence the general denomination of *Antipædobaptiſts*; which includes Anabaptiſts, Baptiſts, Mennonites, Waterlandians, &c. as diſtinguiſhed by their reſpective peculiarities: though *Anabaptiſts* ſeem to have been adopted by moſt writers as the general term.

To the above peculiar notion concerning the baptiſmal ſacrament the Anabaptiſts added principles of a different nature, depending upon certain ideas which they entertained concerning a perfect church-eſtabliſhment, pure in its members, and free from the inſtitutions of human policy.

The Anabaptiſts appear to have made little noiſe, or to have been little noticed before the time of the reformation in Germany. The moſt prudent and rational part of them conſidered it poſſible, by human wiſdom, induſtry, and vigilance, to purify the church from the contagion of the wicked, provided the manners and ſpirit of the primitive Chriſtians could but recover their loſt dignity and luſtre; and ſeeing the attempts of Luther, ſeconded by ſeveral perſons of eminent piety, prove ſo ſucceſsful, they hoped that the happy period was arrived in which the reſtoration of the church to purity was to be accompliſhed, under the divine protection, by the labours and counſels of pious and eminent men. Others, far from being ſatisfied with the plan of reformation propoſed by Luther, looked upon it as much beneath the ſublimity of their views; and conſequently undertook a more perfect reformation, or, to expreſs more properly their viſionary enterpriſe, they propoſed to found a new church, entirely ſpiritual, and truly divine.

This ſect was ſoon joined by great numbers, and (as uſually happens in ſudden revolutions of this nature) by many perſons whoſe characters and capacities were very different, though their views ſeemed to turn upon the ſame object. Their progreſs was rapid; for, in a very ſhort ſpace of time, their diſcourſes, viſions, and predictions, excited commotions in a great part of Europe and drew into their communion a prodigious multitude, whoſe ignorance rendered them eaſy victims to the illuſions of enthuſiaſm. The moſt pernicious faction of all thoſe which compoſed this motley multitude, was that which pretended that the founders of the new and *perfect church*, already mentioned, were under the direction of a divine impulſe, and were armed againſt all oppoſition by the power of working miracles. It was this faction that, in the year 1521, began their fanatical work, under the guidance of Munzer, Stubner, Storck, &c.

Theſe perſons were diſciples of Luther; but well knowing that their opinions were ſuch as would receive no ſanction from him, they availed themſelves of his abſence to diſſeminate them in Wittemburgh, and had the addreſs to over-reach the piety of Melancthon. Their principal purpoſe was to gain over the populace, and to form a conſiderable party. To effect this, ſays Bayle, they were induſtrious and active, each in his own way. Storck, wanting knowledge, boaſted of inſpiration; and Stubner, who had both genius and erudition, laboured at commodious explications of Scripture. Not content with diſcrediting the court of Rome, and decrying the authority of conſiſtories, they taught, That among Chriſtians, who had the precepts of the goſpel to direct and the Spirit of God to guide them, the office of magiſtracy was not only unneceſſary, but an unlawful encroachment on their ſpiritual liberty; that the diſtinctions occaſioned by birth, or rank, or wealth, being contrary to the ſpirit of the goſpel, which conſiders all men as equal, ſhould be entirely aboliſhed; that all Chriſtians, throwing their poſſeſſions into one common ſtock, ſhould live together in that ſtate of equality which becomes members of the ſame family; that, as neither the laws of nature nor the precepts of the New Teſtament had placed any reſtraint upon men with regard to the number of wives which they might marry, they ſhould uſe that liberty which God himſelf had granted to the patriarchs.

They employed at firſt the various arts of perſuaſion in order to propagate their doctrine. They preached, exhorted, admoniſhed, and reaſoned in a manner that ſeemed proper to impreſs the multitude; and related a great number of viſions and revelations with which they pretended to have been favoured from above. But when they ſaw that theſe methods of making proſelytes were not attended with ſuch a rapid ſucceſs as they fondly expected, and that the miniſtry of Luther and other eminent reformers were detrimental to their cauſe, they then had recourſe to more expeditious meaſures, and madly attempted to propagate their fanatical doctrine by force of arms. Munzer and his aſſociates, in the year 1525, put themſelves at the head of a numerous army, compoſed for the moſt part of the peaſants of Suabia, Thuringia, Franconia, and Saxony, and declared war againſt all laws, government, and magiſtrates of every kind, under the chimerical pretext that Chriſt was now to take the reins of civil and eccleſiaſtical government into his own hands, and to rule alone over the nations. But this ſeditious crowd was routed and diſperſed, without much difficulty, by the Elector of Saxony and other princes; and Munzer their ringleader ignominiouſly put to death, and his factious counſellors ſcattered abroad in different places.

Many of his followers, however, ſurvived, and propagated their opinions through Germany, Switzerland, and Holland. In the year 1533, a party of them ſettled at Munſter under the direction of two Anabaptiſt prophets, John Matthias a baker of Haerlem, and John Bockholdt a journeyman-taylor of Leyden. Having made themſelves maſters of the city, they depoſed the magiſtrates, confiſcated the eſtates of ſuch as had eſcaped, and depoſited the wealth they amaſſed together in a public treaſury for common uſe. They made preparations of every kind for the defence of the city; and ſent out emiſſaries to the Anabaptiſts in the Low Countries, inviting them to aſſemble at Munſter, which was now dignified with the name of Mount Sion, that from hence they might be deputed to reduce all the nations of the earth under their dominion. Matthias, who was the firſt in command, was ſoon cut off in an act of phrenſy by the biſhop of Munſter's army; and was ſucceeded by Bockholdt, who was proclaimed by a ſpecial deſignation of Heaven, as he pretended, king of Sion, and inveſted with legiſlative powers like thoſe of Moſes. The extravagances of Bockholdt were too numerous to be recited: it will be ſufficient to add, that the city of Munſter was taken after a long ſiege and an obſtinate reſiſtance; and Bockholdt, the mock monarch, was puniſhed with a moſt painful and ignominious death.

It muſt, however, be acknowledged that the true riſe of the numerous inſurrections of this period ought not to be attributed to religious opinions. The firſt inſurgents groaned under the moſt grievous oppreſſions; they took up arms principally in defence of their civil liberties; and of the commotions that took place. The Anabaptiſt leaders above mentioned ſeem rather to have availed themſelves, than to have been the prime movers. See the article Reformation.—That a great part of the main body, indeed, conſiſted of Anabaptiſts ſeems indiſputable; and whatever fanaticiſm exiſted among them would naturally be called forth or inflamed by the ſituations that occurred, and run riot in its wildeſt ſhapes. At the ſame time it appears from hiſtory, that a great part alſo conſiſted of Roman-Catholics, and a ſtill greater of perſons who had ſcarcely any religious principles at all. Indeed, when we read of the vaſt numbers that were concerned in thoſe inſurrections, of whom it is reported that 100,000 fell by the ſword, it appears reaſonable to conclude that a great majority of them were not Anabaptiſts.

Before concluding this article, it muſt be remarked, that the Baptiſts or Mennonites in England and Holland are to be conſidered in a very different light from the enthuſiaſts we have been deſcribing: and it appears equally uncandid and invidious, to trace up their diſtinguiſhing ſentiment, as ſome of their adverſaries have done, to thoſe obnoxious characters, and there to ſtop, in order as it were to aſſociate with it the ideas of turbulence and fanaticiſm, with which it certainly has no natural connection. Their coincidence with ſome of thoſe oppreſſed and infatuated people in denying baptiſm to infants, is acknowledged by the Baptiſts: but they diſavow the practice which the appellation of *Anabaptiſts* implies; and their doctrines ſeem referable to a more ancient and reſpectable origin. They appear ſupported by hiſtory in conſidering themſelves as the deſcendants of the Waldenſes, who were ſo grievouſly oppreſſed and perſecuted by the deſpotic heads of the Romiſh hierarchy; and they profeſs an equal averſion to all principles of rebellion on one hand, and to all ſuggeſtions of fanaticiſm on the other. See Baptists.—The denomination of *Mennonites*, by which they are diſtinguiſhed in Holland, they derive from Menno, the famous man who latterly gave conſiſtence and ſtability to their ſect. See Mennonites.

ANABASII, in antiquity, were couriers who were ſent on horſeback, or in chariots, with diſpatches of importance.

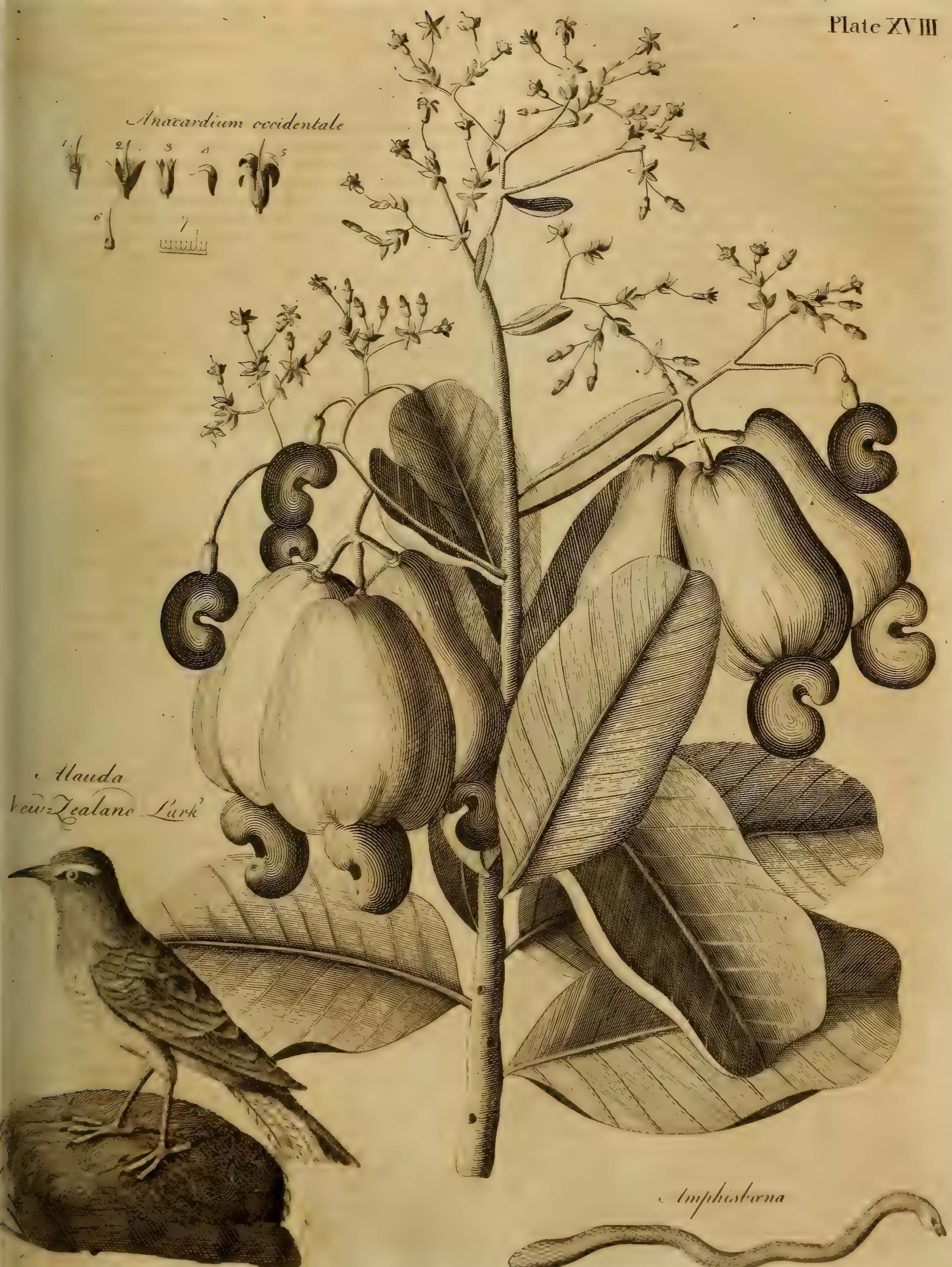
ANABATHRA, in ancient writers, denote a kind of ſteps or ladder whereby to aſcend to ſome eminence. In this ſenſe we read of the anabathra of theatres, pulpits, &c. Anabathra appears to have been ſometimes alſo applied to ranges of ſeats riſing gradually over each other.

Anabathra is more particularly applied to a kind of ſtone blocks raiſed by the high-way ſides, to aſſiſt travellers in mounting or alighting, before the uſe of ſtirrups was invented.—The firſt author of this contrivance among the Romans was C. Gracchus brother of Tiberius.

ANABLEPS, in ichthyology, the trivial name of a ſpecies of cobitis. See Cobitis.

ANABOA, a ſmall iſland ſituated near the coaſt of

Plate XVIII


Anacardium occidentale
1
2
3
4
5
6
7
Alauda
New-Zealand Lark
Amphisbæna

Scot Philada

Loango in Africa, in E. Long. 9°. N. Lat. 1°. Here are ſeveral fertile valleys, which produce plenty of bananas, oranges, pine-apples, lemons, citrons, tamarinds, cocoa-nuts, &c. together with vaſt quantities of cotton. In this iſland are two high mountains, which, being continually covered with clouds, occaſion frequent rains.

ANABOLÆUM, or ANABOLE, in antiquity, a kind of great or upper coat, worn over the tunica.

ANABOLEUS, in antiquity, an appellation given to grooms of the ſtable, or equerries, who aſſiſted their maſters in mounting their horſes. As the ancients had no ſtirrups, or inſtruments that are now in uſe for mounting a horſe, they either jumped upon his back, or were aided in mounting by anabolei.

ANACALYPTERIA, according to Suidas, were preſents made to the bride by her huſband's relations and friends when ſhe firſt uncovered her face and ſhowed herſelf to men. Theſe preſents were alſo called επαυλαια: for among the Greeks, virgins before marriage were under ſtrict confinement, being rarely permitted to appear in public, or converſe with the other ſex; and when allowed that liberty, wore a veil over their faces termed Καλυπτρον, or Καλυπτρα, which was not left off in the preſence of men till the third day after marriage; whence, according to Heſychius, this was alſo called *anacalypterion*.

ANACAMPSEROS, in botany, a ſynonime of the portulaca and ſeveral other plants.

ANACAMPTERIA, in eccleſiaſtical antiquity, a kind of little edifices adjacent to the churches, deſigned for the entertainment of ſtrangers and poor perſons.

ANACAMPTIC, a name applied by the ancients to that part of optics which treats of reflexion, being the ſame with what is now called CATOPTRICS.

ANACARDIUM, or CASHEW-NUT TREE: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 12th order, *Holoraceæ*. The characters are: The *calyx* is divided into five parts, the diviſions ovate and deciduous: The *corolla* conſiſts of five reflected petals, twice the length of the calyx: The *ſtamina* conſiſt of ten capillary filaments ſhorter than the calyx, one of them caſtrated; the antheræ are ſmall and roundiſh: The *piſtillum* has a roundiſh germen: the ſtylus is ſubulated, inflected, and the length of the corolla; the ſtigma oblique: There is no *pericarpium*; the receptaculum is very large and fleſhy: The *ſeed* is a large kidney-ſhaped nut, placed above the receptaculum.

Of this only one ſpecies is as yet known to the botaniſts, viz. the occidentale. It grows naturally in the Weſt Indies, and arrives at the height of 20 feet in thoſe places of which it is a native. The fruit of this tree is as large as an orange; and is full of an acid juice, which is frequently made uſe of in making punch. To the apex of this fruit grows a nut, of the ſize and ſhape of a hare's kidney, but much larger at the end which is next the fruit than at the other. The ſhell is very hard; and the kernel, which is ſweet and pleaſant, is covered with a thin film. Between this and the ſhell is lodged a thick, blackiſh, inflammable liquor, of ſuch a cauſtic nature in the freſh nuts, that if the lips chance to touch it, bliſters will immediately follow. The kernels are eaten raw, roaſted, or pickled. The cauſtic liquor juſt mentioned is eſteemed an excellent coſmetic with the Weſt India young ladies, but they muſt certainly ſuffer a great deal of pain in its application; and, fond as our females are of a beautiful face, it is highly probable they would never ſubmit to be flayed alive to obtain one. When any of the former fancy themſelves too much tanned by the ſcorching rays of the ſun, they gently ſcrape off the thin outſide of the ſtone, and then rub their faces all over with the ſtone. Their faces immediately ſwell and grow black; and the ſkin being poiſoned by the cauſtic oil abovementioned, will, in the ſpace of five or ſix days, come entirely off in large flakes, ſo that they cannot appear in public in leſs than a fortnight; by which time the new ſkin looks as fair as that of a new-born child. The negroes in Brazil cure themſelves effectually of diſorders in the ſtomach by eating of the yellow fruit of this tree; the juice of which, being acid, cuts the thick tough humours which obſtructed the free circulation of the blood, and thus removes the complaint. This cure, however, is not voluntary: for their maſters, the Portugueſe, deny them any other ſuſtenance; and letting them looſe to the woods, where the caſhew-nuts grow in great abundance, leave it in their option to periſh by famine or ſuſtain themſelves with this fruit.—The milky juice of this tree will ſtain linen of a good black, which cannot be waſhed out. See Plate XVIII.

Culture. This plant is eaſily raiſed from the nuts, which ſhould be planted each in a ſeparate pot filled with light ſandy earth, and plunged into a good hotbed of tanners bark; they muſt alſo be kept from moiſture till the plants come up, otherwiſe the nuts are apt to rot. If the nuts are freſh, the plants will come up in about a month.

ANACEPHALÆOSIS, in rhetoric, the ſame with recapitulation. See RECAPITULATION.

ANACHARSIS, a famous Scythian philoſopher, converſed with Solon, and lived an auſtere life. Upon his return from his travels through Greece, he attempted to change the ancient cuſtoms of Scythia, and to eſtabliſh thoſe of Greece; which proved fatal to him. The king ſhot him dead in a wood with an arrow. A great many ſtatues were erected to him after his death. He is ſaid to have invented tinder, the anchor, and the potter's wheel; but the latter is mentioned by Homer, who lived long before him. Anacharſis flouriſhed in the time of Crœſus.

ANACHORET, in church-hiſtory, denotes a hermit, or ſolitary monk, who retires from the ſociety of mankind into ſome deſart, with a view to avoid the temptations of the world, and to be more at leiſure for meditation and prayer. Such were Paul, Anthony, and Hilarion, the firſt founders of monaſtic life in Egypt and Paleſtine.

Anachorets, among the Greeks, conſiſt principally of monks, who retire to caves or cells, with the leave of the abbot, and an allowance from the monaſtery; or who, weary of the fatigues of the monaſtery, purchaſe a ſpot of ground, to which they retreat, never appearing again in the monaſtery, unleſs on ſolemn occaſions.

ANACHRONISM, in matters of literature, an error with reſpect to chronology, whereby an event is placed earlier than it really happened.—The word is compounded of ανα, "higher," and χρονος, "time."

Such is that of Virgil, who placed Dido in Africa at the time of Æneas, though in reality ſhe did not come there till 300 years after the taking of Troy.—An error on the other ſide, whereby a fact is placed later and lower than it ſhould be, is called a *parachroniſm*.

ANACLASTIC GLASSES, a kind of ſonorous phials or glaſſes, chiefly made in Germany, which have the property of being flexible; and emitting a vehement noiſe by the human breath.—They are alſo called *vexing glaſſes* by the Germans *(vexier glaſer)*, on account of the fright and diſturbance they occaſion by their reſilition.—The anaclaſtic glaſſes are a low kind of phials, with flat bellies, reſembling inverted funnels, whoſe bottoms are very thin, ſcarce ſurpaſſing the thickneſs of an onion peel: this bottom is not quite flat, but a little convex. But upon applying the mouth to the orifice, and gently inſpiring, or as it were ſucking out the air, the bottom gives way with a prodigious crack, and of convex becomes concave. On the contrary, upon exſpiring or breathing gently into the orifice of the ſame glaſs, the bottom with no leſs noiſe bounds back to its former place, and becomes gibbous as before. —The anaclaſtic glaſſes firſt taken notice of were in the caſtle of Goldbach; where one of the academiſts *Naturæ Curioſorum*, having ſeen and made experiments on them, publiſhed a piece expreſsly on on their hiſtory and phenomena. They are all made of a fine white glaſs. It is to be obſerved of theſe, 1. That if the bottom be concave at the time of inſpiration, it will burſt; and the like will happen if it be convex at the time of exſpiration. 2. A ſtrong breath will have the ſame effect even under the contrary circumſtances.

ANACLASTICS, that part of optics which conſiders the refraction of light, and is commonly called *Dioptrics*. See DIOPTRICS.

ANACLETERIA, in antiquity, a ſolemn feſtival celebrated by the ancients when their kings or princes came of age, and aſſumed the reins of government. It was ſo called, becauſe proclamation being made of this event to the people, they went to ſalute their prince during the anacleteria, and to congratulate him upon his new dignity.

ANACLETICUM, in the ancient art of war, a particular blaſt of the trumpet, whereby the fearful and flying ſoldiers were rallied and recalled to the combat.

ANACLINOPALE, Ανακλινοϖαλη, in antiquity, a kind of wreſtling, wherein the champions threw themſelves voluntarily on the ground, and continued the combat by pinching, biting, ſcratching, and other methods of offence. The *Anaclinopale* was contradiſtinguiſhed from the *Orthopale*, wherein the champions ſtood erect. In the *Anaclinopale*, the weaker combatants ſometimes gained the victory.

ANACLINTERIA, in antiquity, a kind of pillows on the dining-bed, whereon the gueſts uſed to lean. The ancient tricliniary beds had four pillows, one at the head, another at the feet, a third at the back, and a fourth at the breaſt. That on which the head lay, was properly called by the Greeks ανακλιτηριον, or ανακλιντρον; by the Romans *fulcrum*, ſometimes *pluteus*.

ANACOLLEMA, a compoſition of aſtringent powders, applied by the ancients to the head, to prevent defluctions on the eyes.

ANACONDO, in natural hiſtory, is a name given in the iſle of Ceylon to a very large and terrible rattle-ſnake, which often devours the unfortunate traveller alive, and is itſelf accounted excellent and delicious fare.

ANACREON, a Greek poet, born at Teos, a city of Ionia, flouriſhed about 532 years before the Chriſtian æra. Polycrates, tyrant of Samos, invited him to his court, and made him ſhare with him in his buſineſs and his pleaſures. He had a delicate wit, as may be judged from the inexpreſſible beauties and graces that ſhine in his works: but he was fond of pleaſure, was of an amorous diſpoſition, and addicted to drunkenneſs: yet, notwithſtanding his debaucheries, he lived to the age of 85; when, we are told, he was choaked by a grape-ſtone which ſtuck in his throat as he was regaling on ſome new wine.

There is but a ſmall part of Anacreon's works that remain; for, beſides his odes and epigrams, he compoſed elegies, hymns, and iambics. His poems which are extant were reſcued from oblivion by Henry Stephens, and are univerſally admired. The verſes of Anacreon are ſweeter, ſays Scaliger, than Indian ſugar. His beauty and chief excellence, ſays Madam Dacier, lay in imitating nature, and in following reaſon; ſo that he preſented to the mind no images but what were noble and natural. The odes of Anacreon, ſays Rapin, are flowers, beauties, and perpetual graces; it is familiar to him to write what is natural and to the life, he having an air ſo delicate, ſo eaſy, and graceful, that among all the ancients there is nothing comparable to the method he took, nor to that kind of writing he followed. He flowed ſoft and eaſy, every where diffuſing the joy and indolence of his mind through his verſe, and tuning his harp to the ſmooth and pleaſant temper of his ſoul. But none has given a juſter character of his writiugs than the God of Love, as taught to ſpeak by Mr Cowley:

All thy verſe is ſofter far
Than the downy feathers are,
Of my wings, or of my arrows,
Of my mother's doves and ſparrows:
Graceful, cleanly, ſmooth, or round,
All with Venus' girdle bound.

ANACREONTIC VERSE, in ancient poetry, a kind of verſe, ſo called from its being much uſed by the poet Anacreon. It conſiſts of three feet and an half, uſually ſpondees and iambuſes, and ſometimes anapeſts: Such is that of Horace,

Lydia, dic per omnes.

ANACRISIS, among the ancient Greeks, is uſed for a kind of trial or examination, which the archons, or chief magiſtrates of Athens, were to undergo before their admiſſion into that office. The *Anacriſis* ſtands diſtinguiſhed from the *docimaſia*, which was a ſecond examination, in the forum. The anacriſis was performed in the ſenate-houſe. The queſtions here propoſed to them were concerning their family, kindred, behaviour, eſtate, &c. Some will have it that all magiſtrates underwent the anacriſis.

ANACRISIS, among civilians, an inveſtigation of truth, interrogation of witneſſes, and inquiry made into any fact, eſpecially by torture.

ANACROSIS, in antiquity, denotes a part of the Pythian ſong, wherein the combat of Apollo and Python are deſcribed.—The anacroſis was the firſt part, and contained the preparation to the fight.

ANACYCLUS, in botany: a genus of the polygamia ſuperflua order, belonging to the ſyngeneſia claſs of plants; and, in the natural method, ranking under the 49th order, *Compoſitæ-diſcoides*. The characters are: The *calyx* is hemiſpheric and imbricated: The *corolla* is radicated: The *ſtamina* conſiſt of five very ſhort capillary filaments; the anthera cylindric and tubular: The *piſtillum* has an oval germen: a filiform ſtylus; a bifid ſtigma in the hermaphrodites, two ſlender reflected ſtigmata in the females: There is no *pericarpium;* but the calyx unchanged: The *ſeeds* are ſolitary, with membranous wings; the *receptaculum* is chaffy.

ANADAVADÆA, in ornithology, a barbarous name of a ſpecies of alauda. See Alauda.

ANADEMA, among the ancients, denotes an ornament of the head, wherewith victors at the ſacred games had their temples bound.

ANADIPLOSIS, in rhetoric and poetry, repetition of the laſt word of a line or clauſe of a ſentence, in the beginning of the next: Thus,

> *Pierides, vos hæc facietis maxima Gallo:*
> *Gallo cujus amor,* &c.
> *Et matutinis accredula vocibus inſtat,*
> *Vocibus inſtat, & aſſiduas jacit ore querelas.*

ANADROMOUS, among ichthyologiſts, a name given to ſuch fiſhes as go from the ſea to the freſh waters at ſtated ſeaſons, and return back again; ſuch as the ſalmon, &c. See Salmon.

ANADUOMENE Venus, in the Grecian mythology, anſwered to the Sea-Venus in the Roman, and was the appellation given to one of the chief deities of the ſea. The moſt celebrated picture in all antiquity was that of this goddeſs by Apelles; and the famous Venus of Medici is a Sea-Venus.

ANÆDEIA, in antiquity, a denomination given to a ſilver ſtool placed in the Areopagus, on which the defendant, or perſon accuſed, was ſeated for examination. The word is Greek, Αναιδεια, which imports imprudence; but according to Junius's correction, it ſhould rather be Αναιτια, q. d. *innocence*. The plaintiff, or accuſer, was placed on an oppoſite ſtool called *hybris*, or injury; here he propoſed three queſtions to the party accuſed, to which poſitive anſwers were to be given. The firſt, Are you guilty of this fact? The ſecond, How did you commit the fact? The third, Who were your accomplices?

ANÆSTHESIA, ſignifies a privation of the ſenſes.

ANAGALLIS, pimpernel: A genus of the monogynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 20th order, *Rotaceæ*. The characters are: The *calyx* is a quinquepartite perianthium, which is perſiſtent: The *corolla* conſiſts of one rotated petal: The *ſtamina* conſiſt of five erect filaments ſhorter than the corolla; the antheræ are ſimple: The *piſtillum* has a globular germen; the ſtylus ſlightly declinated, the ſtigma headed: The *pericarpium* is a globular capſule, unilocular and circumciſed: The *ſeeds* are numerous and angled; the receptaculum globular and very large. Of this there are four

Species. 1. The arvenſis, or common pimpernel, with a red flower. 2. The fæmina, with a blue flower. 3. The monelli, or narrow-leaved pimpernel. 4. The latifolia, or Spaniſh pimpernel.—The firſt ſort is very common in corn-fields, and other cultivated places in Britain. The ſecond is ſometimes found wild in the fields, but is not ſo common as the firſt. The third is a beautiful ſmall perennial plant, and produces numbers of fine blue flowers. The fourth is a native of Spain, and likewiſe produces blue flowers.

Theſe plants are very eaſily propagated by ſeeds; and if ſuffered to remain till their ſeeds ſcatter, they become troubleſome weeds.—The arvenſis is not unfrequently taken as food; it makes no unpleaſant ſalad, and in ſome parts of Great-Britain is a common pot-herb. All the ſpecies are eat by cows and goats, but refuſed by ſheep; ſmall birds are greatly delighted with the ſeeds.—Great medicinal virtues were formerly expected from the firſt two ſpecies; but they are now juſtly diſregarded.

ANAGNIA, (anc. geog.), a town of Latium, capital of the Hernici; which, after a faint reſiſtance, ſubmitting to the Romans, was admitted to the freedom of the city, yet without the right of ſuffrage, (Livy). It was afterwards a colony of Druſus Cæſar, and walled round, and its territory aſſigned to the veterans, (Frontinus.) Here Antony married Cleopatra, and divorced Octavia. Now *Anagni*, 36 miles to the eaſt of Rome. E. Long. 13. 45. Lat. 42. 48.

ANAGNOSTA, or Anagnostes, in antiquity, a kind of literary ſervant, retained in the families of perſons of diſtinction, whoſe chief buſineſs was to read to them during meals, or at any other time when they were at leiſure. Cornelius Nepos relates of Atticus, that he had always an anagnoſtes at his meals. He never ſupped without reading; ſo that the minds of his gueſts were no leſs agreeably entertained than their appetites. The ſame cuſtom, Eginhard obſerves, was kept up by Charlemagne, who at table had the hiſtories and acts of ancient kings read to him. This cuſtom ſeems to have been a relic of that of the ancient Greeks, who had the praiſes of great men and heroes ſung to them while at table. The ancient monks and clergy kept up the like uſage, as we are informed by St Auguſtin.

ANAGOGICAL, ſignifies myſterious, tranſporting; and is uſed to expreſs whatever elevates the mind, not only to the knowledge of divine things, but of divine things in the next life. This word is ſeldom uſed, but with regard to the different ſenſes of Scripture. The anagogical ſenſe is, when the ſacred text is explained with a regard to eternal life, the point which Chriſtians ſhould have in view: for example, the reſt of the ſabbath, in the anagogical ſenſe, ſignifies the repoſe of everlaſting happineſs.

ANAGOGY, or Anagoge, among eccleſiaſtical writers, the elevation of the mind to things celeſtial and eternal.—It is particularly uſed, where words, in their natural or primary meaning, denote ſomething ſenſible, but have a further view to ſomething ſpiritual or inviſible.

Anagogy, in a more particular ſenſe, denotes the application of the types and allegories of the Old Teſtament to ſubjects of the New; thus called, becauſe the veil being here drawn, what before was hidden, is expoſed to open ſight.

ANAGRAM (from the Greek ανα *backwards*, and *γραμμα letter*), in matters of literature, a tranſpoſition of the letters of ſome name, whereby a new word is formed, either to the advantage or diſadvantage of the perſon or thing to which the name belongs. Thus, the anagram of Galenus is *angelus;* that of Logica, *caligo;* that of Alſtedius, *ſedulitas;* that of Loraine is *alerion*, on which account it was that the family of Loraine took *alerions* for their armoury.—Calvin, in the title of his *Inſtitutions*, printed at Straſburg in 1539, calls himſelf *Alcuinus*, which is the anagram of Calvinus, and the name of an eminently learned perſon in the time of Charlemagne, who contributed greatly to the reſtoration of learning in that age.

Thoſe who adhere ſtrictly to the definition of an anagram, take no other liberty than that of omitting or retaining the letter H, at pleaſure; whereas others make no ſcruple to uſe E for Æ, V for W, S for Z, and C for K; and *vice verſa*.

Beſides anagrams formed as above, we meet with another kind in ancient writers, made by dividing a ſingle word into ſeveral; thus *ſus tinea mus*, are formed out of the word *ſuſtineamus*.

Anagrams are ſometimes alſo made out of ſeveral words: ſuch is that on the queſtion put by Pilate to our Saviour, *Quid eſt veritas?* whereof we have this admirable anagram, viz. *Eſt vir qui adeſt*.

The Cabbaliſts among the Jews are profeſſed anagrammatiſts; the third part of their art, which they call *themuru*, i. e. "changing," being nothing but the art of making anagrams, or of finding hidden and myſtical meanings in names; which they do by changing, tranſpoſing, and differently combining, the letters of thoſe names.—Thus, of נח the letters of Noah's name, they make חן *grace;* of משיח *the Meſſiah*, they make ישמח *he ſhall rejoice*.

ANAGRAMMATIST, a maker or compoſer of anagrams. Thomas Billon, a provincial, was a celebrated anagrammatiſt, and retained by Lewis XIII. with a penſion of 1200 livres, in quality of anagrammatiſt to the king.

ANAGROS, in commerce, a meaſure for grain uſed in ſome cities of Spain, particularly at Seville; 46 anagros make about 10¼ quarters of London.

ANAGYRIS, STINKING BEAN-TREFOIL: A genus of the monogynia order, belonging to the decandria claſs of plants; and, in the natural method, ranking under the 32d order, *Papilionaceæ*. The characters are: The *calyx* is a bell-ſhaped perianthium: The *corolla* is papilionaceous; the vexillum cordated, ſtraight, emarginated, and twice as long as the calyx; the alæ ovate, and longer than the vexillum; the carina ſtraight and very long: The *ſtamina* conſiſt of 10 filaments; the antheræ ſimple: The *piſtillum* has an oblong germen, a ſimple ſtylus, and a villous ſtigma: The *pericarpium* is an oblong legumen: The *ſeeds* are ſix or more, and kidney-ſhaped.

Of this genus there is but one ſpecies, the fetida, which grows naturally in the ſouthern parts of Europe. It is a ſhrub which uſually riſes to the height of eight or ten feet, and produces its flowers in April or May. Theſe are of a bright yellow colour, growing in ſpikes, ſomewhat like the laburnum.

Culture. This plant may be propagated either by ſeeds, or by laying down the tender branches in the ſpring; but the firſt method is preferable. The ſeeds ſhould be ſown towards the end of March in pots filled with light earth, and plunged in a gentle hot-bed. The plants uſually appear in a month, when they ſhould be gradually inured to the open air, that they may be hardened before winter. In the autumn and winter, they muſt be ſheltered under a hot-bed frame: the ſpring following, they muſt be tranſplanted, each into a ſeparate ſmall pot, placed in a ſheltered ſituation, and again removed into a frame to ſhelter them during the following winter. The ſecond ſpring after the plants come up, ſome of them may be taken out of the pots, and planted in a border near a ſouth wall, where, if they are protected in winter, they may remain.

ANAGYRIS or ANAGYRUS, the name of a place in Attica, of the tribe Erechtheis, where a fetid plant, called *Anagyris*, probably the ſame with the foregoing, grew in great plenty, (Dioſcorides, Pliny, Stephanus;) and the more it was handled, the ſtronger it ſmelled: hence *commovere anagyrin* (or *anagyrum*), is to bring a misfortune on one's ſelf, (Ariſtophanes.)

ANAK, the father of the Anakims, was the ſon of Arba, who gave his name to Kirjath-arba, or Hebron, Joſh. xiv. 15. Anak had three ſons, Sheſhai, Ahiman, and Talmai, (chap. xv. 14. and Numb. xiii. 22.) who, as well as their father, were giants, and who, with their poſterity, all terrible for their fierceneſs and extraordinary ſtature, were called the *Anakims;* in compariſon of whom the Hebrews, who were ſent to view the land of Canaan, reported that they were but as graſshoppers. Numb. xiii. *ult.* Caleb, aſſiſted by the tribe of Judah, took Kirjath-arba, and deſtroyed the Anakims, (Judges i. 20. and Joſh. xv. 14.) in the year of the world 2559.

ANALECTA, or ANALECTES, in antiquity, a ſervant whoſe employment it was to gather up the offfalls of tables.

ANALECTA, *Analects*, in a literary ſenſe, is uſed to denote a collection of ſmall pieces; as eſſays, remarks, &c.

ANALEMMA, in geometry, a projection of the ſphere on the plane of the meridian, orthographically made by ſtraight lines and ellipſes, the eye being ſuppoſed at an infinite diſtance, and in the eaſt, or weſt, points of the horizon.

ANALEMMA, donotes likewiſe an inſtrument of braſs or wood, upon which this kind of projection is drawn, with an horizon and curſor fitted to it, wherein the ſolſtitial colure, and all circles parallel to it, will be concentric circles; all circles oblique to the eye, will be ellipſes; and all circles whoſe planes paſs through the eye, will be right lines. The uſe of this inſtrument is to ſhow the common aſtronomical problems; which it will do, though not very exactly, unleſs it be very large.

ANALEPSIS, the augmentation or nutrition of an emaciated body.

ANALEPTICS, reſtorative or nouriſhing medicines.

ANALOGY, in philoſophy, a certain relation and agreement between two or more things, which in other reſpects are entirely different.

There is likewiſe an analogy between beings that have ſome conformity or reſemblance to one another; for example, between animals and plants; but the analogy is ſtill ſtronger between two different ſpecies of certain animals.

Analogy enters much into all our reaſoning; and ſerves to explain and illuſtrate. A great part of our philoſophy, indeed, has no other foundation than analogy.

It is natural for mankind to judge of things leſs known, by ſome ſimilitude, real or imaginary, between them and things more familiar or better known. And where the things compared have really a great ſimilitude in their nature, when there is reaſon to think that they are ſubject to the ſame laws, there may be a conſiderable degree of probability in concluſions drawn from analogy. Thus we may obſerve a very great ſimilitude between this earth which we inhabit, and the other planets, Saturn, Jupiter, Mars, Venus, and Mercury. They all revolve round the ſun, as the earth does, although at different diſtances, and in different periods. They borrow all their light from the ſun, as the earth does. Several of them are known to revolve round their axis like the earth, and, by that means, muſt have a like ſucceſſion of day and night. Some of them have moons, that ſerve to give them light in the abſence of the ſun, as our moon does to us. They are all, in their motions, ſubject to the ſame law of gravitation, as the earth is. From all this ſimilitude, it is not unreaſonable to think, that thoſe planets may, like our earth, be the habitation of various orders of living creatures. There is ſome probability in this concluſion from analogy.

But it ought to be obſerved, that, as this kind of reaſoning can afford only probable evidence at beſt; ſo, unleſs great caution be uſed, we are apt to be led into error by it. To give an inſtance of this: Anatomiſts, in ancient ages, ſeldom diſſected human bodies; but very often the bodies of thoſe quadrupeds whoſe internal ſtructure was thought to approach neareſt to that of the human body. Modern anatomiſts have diſcovered many miſtakes the ancients were led into, by their conceiving a greater ſimilitude between the ſtructure of men and of ſome beaſts than there is in reality.

Reid on the Intellectual Powers, Eſſay I. ch. iv. p. 52.

Perhaps no author has made a more juſt and a more happy uſe of this mode of reaſoning, than Biſhop Butler in his Analogy of Religion, Natural and Revealed, to the Conſtitution and Courſe of Nature. In that excellent work, the author does not ground any of the truths of religion upon analogy, as their proper evidence. He only makes uſe of analogy to anſwer objections againſt them. When objections are made againſt the truths of religion, which may be made with equal ſtrength againſt what we know to be true in the courſe of nature, ſuch objections can have no weight.

Analogical reaſoning, therefore, may be of excellent uſe in anſwering objections againſt truths which have other evidence. It may likewiſe give a greater or a leſs degree of probability in caſes where we can find no other evidence. But all arguments drawn from analogy are ſtill the weaker, the greater the diſparity is between the things compared; and therefore muſt be weakeſt of all when we compare body with mind, becauſe there are no two things in nature more unlike.

There is no ſubject in which men have always been ſo prone to form their notions by analogies of this kind, as in what relates to the mind. We form an early acquaintance with material things by means of our ſenſes, and are bred up in a conſtant familiarity with them. Hence we are apt to meaſure all things by them; and to aſcribe to things moſt remote from matter the qualities that belong to material things. It is for this reaſon that mankind have, in all ages, been ſo prone to conceive the mind itſelf to be ſome ſubtle kind of matter: That they have been diſpoſed to aſcribe human figure, and human organs, not only to angels, but even to the Deity.

To illuſtrate more fully that analogical reaſoning from a ſuppoſed ſimilitude of mind to body, which appears to be the moſt fruitful ſource of error with regard to the operations of our minds, the following inſtance may be given. When a man is urged by contrary motives, thoſe on one hand inciting him to do ſome action, thoſe on the other to forbear it; he deliberates about it, and at laſt reſolves to do it, or not to do it. The contrary motives are here compared to the weights in the oppoſite ſcales of a balance; and there is not perhaps any inſtance that can be named of a more ſtriking analogy between body and mind. Hence the phraſes of weighing motives, of deliberating upon actions, are common to all languages.

From this analogy ſome philoſophers draw very important concluſions. They ſay, that as the balance cannot incline to one ſide more than the other, when the oppoſite weights are equal; ſo a man cannot poſſibly determine himſelf if the motives on both hands are equal; and as the balance muſt neceſſarily turn to that ſide which has moſt weight, ſo the man muſt neceſſarily be determined to that hand where the motive is ſtrongeſt. And on this foundation ſome of the ſchoolmen maintained, that if a hungry aſs were placed between two bundles of hay equally inviting, the beaſt muſt ſtand ſtill and ſtarve to death, being unable to turn to either, becauſe there are equal motives to both. This is an inſtance of that analogical reaſoning, which, it is conceived, ought never to be truſted; for the analogy between a balance and a man deliberating, though one of the ſtrongeſt that can be found between matter and mind, is too weak to ſupport any argument. A piece of dead inactive matter, and an active intelligent being, are things very unlike; and becauſe the one would remain at reſt in a certain caſe, it does not follow that the other would be inactive in a caſe ſomewhat ſimilar. The argument is no better than this, that, becauſe a dead animal moves only as it is puſhed, and, if puſhed with equal force in contrary directions, muſt remain at reſt; therefore the ſame thing muſt happen to a living animal; for ſurely the ſimilitude between a dead animal and a living, is as great as that between a balance and a man.

The derivation of the word Analogy indicates, as profeſſor Caſtillon of Berlin * obſerves, a reſemblance diſcernible by reaſon. This is confirmed by the ſenſe in which the term is uſed in geometry, where it ſignifies an equality of ratios.—In explaining this ſubject, it is obſerved, there may be a reſemblance between ſenſations and a reſemblance between perceptions: the former is called *phyſical reſemblance*, becauſe it acts upon the phyſical or ſenſitive faculty; the latter *moral reſemblance*, becauſe it affects the moral or rational faculty of man.

Every reſemblance may be reduced to an equality in ſenſations or perceptions; but this ſuppoſes ſome equality in their cauſes: we ſay *ſome equality*, becauſe the diſpoſition of the organs, or of the ſoul, muſt neceſſarily

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* *Haarlem Memoirs* for 1786, or vol. xxii.

rily affect the ſenſations or perceptions; but this can influence only their degree, and not their nature.

The character of one perſon reſembles that of another only when they both ſpeak and act ſo as to excite equal perceptions, or, to ſpeak more ſtrictly, the ſame perception: when they both diſplay vivacity or indifference, anger or meekneſs, on the ſame occaſions, and both excite in the ſoul of the obſerver identical perceptions, or rather the ſame perception of vivacity or indifference, of anger or meekneſs. Theſe identical perceptions, the degree of which will depend much on the diſpoſition of the obſerver's mind, muſt have identical cauſes, or, in other words, the ſame cauſe; which is the vivacity or indifference, the anger or meekneſs, diſplayed by each of theſe characters.

Every phyſical reſemblance may therefore be reduced to one or more equalities; and every moral reſemblance to one or more identities. Wherever there is moral reſemblance, there is analogy. Analogy may therefore be reduced to identity, and always ſuppoſes compariſon.

Two objects are ſaid to have an analogy to each other, or are called *analogous*, when ſome identity is diſcovered upon comparing them. An *analogical concluſion*, is a concluſion deduced from ſome identity.

The principles of analogy are a compariſon of two objects; and one or more identities reſulting from their being thus compared. The characters of analogy are —that two objects be compared—that there be one or more identities between theſe objects—and that this is diſcernible only by reaſon or intellect.

Phyſical reſemblance is to the ſenſes what *analogy* is to the underſtanding.—The former, when perfect, becomes equality; but the latter identity.

Reſemblance and analogy are the foundations both of probability and of certainty. When we are not ſatisfied that the reſemblance or the analogy is complete, we ſtop at probability; which becomes certainty when we are, or think we are, aſſured that the reſemblance or the analogy is perfect.

In reaſoning by analogy, we ſhould be careful not to confound it with reſemblance; and alſo not to deduce from the identity or identities, on which the analogy is founded, a concluſion, which has either no relation, or a partial relation, to theſe identities.

The principal uſe of analogy in the inveſtigation of phyſical and moral truth, according to our author, may be reduced to the four following: 1. By means of our ſenſes to improve, firſt, our own judgment, and afterwards that of others, with reſpect to intellectual ſubjects. 2. To deduce a general from a particular truth. Having diſcovered and proved the truth of a propoſition with reſpect to any particular object, examine whether this truth flows from a quality peculiar to this ſingle object, or common to ſeveral objects. In the latter caſe all theſe objects may be comprehended under one general idea, founded on their common quality. Subſtitute this general idea inſtead of the particular object, and the propoſition will become general, without ceaſing to be true; becauſe whatever evidently and ſolely reſults from the identity, on which an analogy is founded, muſt neceſſarily be true with reſpect to all thoſe objects in which the analogy is the ſame. 3. To prove the truth or falſehood of propoſitions which cannot be otherwiſe demonſtrated. 4. To diſcover new truths in both natural and moral philoſophy.

Analogy, among grammarians, is the correſpondence which a word or phraſe bears to the genius and received forms of any language.

ANALYSIS, in a general ſenſe, implies the reſolution of ſomething compounded, into its original and conſtituent parts. The word is Greek, and derived from ἀναλυω, to reſolve.

Analysis, in mathematics, is properly the method of reſolving problems by means of algebraical equations; hence we often find that theſe two words, *analyſis* and *algebra*, are uſed as ſynonymous.

Analyſis, under its preſent improvements, muſt be allowed the apex or height of all human learning: it is this method which furniſhes us with the moſt perfect example of the art of reaſoning; gives the mind an uncommon readineſs at deducing and diſcovering, from a few data, things unknown; and, by uſing ſigns for ideas, preſents things to the imagination, which otherwiſe ſeemed out of its ſphere: by this, geometrical demonſtrations may be greatly abridged, and a long ſeries of argumentations, wherein the mind cannot without the utmoſt effort and attention diſcover the connection of ideas, are hereby converted into ſenſible ſigns, and the ſeveral operations required therein effected by the combination of thoſe ſigns. But, what is more extraordinary, by means of this art, a number of truths are frequently expreſſed by a ſingle line, which, in the common way of explaining and demonſtrating things, would fill whole volumes. Thus, by mere contemplation of one ſingle line, whole ſciences may be ſometimes learnt in a few minutes time, which otherwiſe could ſcarce be attained in many years.

Analysis is divided, with regard to its object, into that of *finites*, and *infinites*.

Analysis of Finite Quantities, is what we otherwiſe call ſpecious arithmetic or algebra. See Algebra.

Analysis of Infinites, called alſo the *New Analyſis*, is particularly uſed for the method of fluxions, or the differential calculus. See Fluxions.

Analysis, in logic, ſignifies the method of tracing things backward to their ſource, and of reſolving knowledge into its original principles. This is alſo called the method of *reſolution*; and ſtands oppoſed to the ſynthetic method, or that of *compoſition*.—The art of logical analyſis conſiſts principally in combining our perceptions, claſſing them together with addreſs, and contriving proper expreſſions for conveying our thoughts, and repreſenting their ſeveral diviſions, claſſes, and relations.

Analysis, in rhetoric, is that which examines the connections, tropes, figures, and the like, inquiring into the propoſition, diviſion, paſſions, arguments, and other apparatus of rhetoric.

Several authors, as Freigius and others, have given analyſes of Cicero's Orations, wherein they reduce them to their grammatical and logical principles; ſtrip them of all the ornaments and additions of rhetoric which otherwiſe diſguiſe their true form, and conceal the connection between one part and another. The deſign of theſe authors is to have thoſe admired harangues juſt ſuch as the judgment diſpoſed them, without the help of imagination; ſo that here we may coolly view the force of each proof, and admire the uſe Cicero made of rhetorical figures to conceal the weak part of a cauſe.

A collection has been made of the analyſes formed by the moſt celebrated authors of the 16th century, in 3 vols. folio.

ANALYSIS is alſo uſed, in chemiſtry, for the decompounding of a mixed body, or the ſeparation of the principles and conſtituent parts of a compounded ſubſtance.

To analyſe bodies, or reſolve them into their component parts, is indeed the chief object of the art of chemiſtry. Chemiſtry furniſhes ſeveral means for the decompoſition of bodies, which are all founded on the differences of the properties belonging to the different principles of which the body to be analyzed is compoſed. If, for example, a body be compoſed of ſeveral principles, ſome of which have a great, and others a moderate degree of volatility, and, laſtly, others are fixed, its moſt volatile parts may be firſt ſeparated by a gradual heat in diſtilling veſſels; and then the parts which are next in volatility will paſs over in diſtillation; and laſtly, thoſe parts which are fixed, and capable of reſiſting the action of the fire, will remain at the bottom of the veſſel.

ANALYSIS is alſo uſed for a kind of ſyllabus, or table of the principal heads or articles of a continued diſcourſe, diſpoſed in their natural order and tendency. Analyſes are more ſcientifical than alphabetical indexes; but they are leſs uſed, as being more intricate.

ANALYSIS is likewiſe uſed for a brief, but methodical, illuſtration of the principles of a ſcience; in which ſenſe it is nearly ſynonymous with what we otherwiſe call a *ſynopſis*.

ANALYTIC, or ANALYTICAL, ſomething that belongs to, or partakes of, the nature of analyſis.—Thus we ſay, an analytical demonſtration, analytical proceſs, analytical table or ſcheme, analytical method of inveſtigation, &c.

The analytic method ſtands oppoſed to the ſynthetic. In natural philoſophy, as in mathematics, the inveſtigation of difficult things by the analytic method ought to precede the method of compoſition. This analyſis conſiſts in making experiments and obſervations, and in drawing general concluſions therefrom by induction; and admitting of no objections againſt the concluſions, but ſuch as are drawn from experiments, and other certain truths: and though the reaſoning from experiments and obſervations by induction be no demonſtration of general concluſions, yet it is the beſt method of reaſoning which the nature of things admits of; and may be eſteemed ſo much the ſtronger, as the induction is more general; and, if no exception occur from phenomena, the concluſion may be pronounced general. By this way of analyſis, we may proceed from compounds to their ingredients; from motions to the forces producing them; and, in general, from effects to their cauſes, and from particular cauſes to more general ones, until we arrive at thoſe which are the moſt general. This is the analytic method, according to the illuſtrious Newton.

The ſynthetic method conſiſts in aſſuming the cauſes diſcovered and received as principles: and by them explaining the phenomena proceeding from them, and proving the explanations. See SYNTHESIS.

ANALYTICS, *Analytica*, the ſcience and uſe of analyſis. The great advantage of the modern mathematics above the ancient is in point of analytics.

Pappus, in the preface to his ſeventh book of Mathematical Collections, enumerates the authors on the ancient analytics; being Euclid, in his *Data* and *Poriſmata*; Apollonius, *de Sectione Rationis*, and in his *Conics*; Ariſtæus, *de Locis Solidis*; and Eratoſthenes, *de Mediis Proportionalibus*. But the ancient analytics were very different from the modern.

To the modern analytics principally belong algebra; an hiſtorical account of which, with the ſeveral authors thereon, ſee under the article ALGEBRA.

ANAMABOA, a populous town in the kingdom of Fantin, in Guinea. The natives are generally great cheats, and muſt be carefully looked after in dealing with them, and their gold well examined, for it is commonly adulterated. It lies under the cannon of an Engliſh caſtle. The landing is pretty difficult on account of the rocks; and therefore thoſe that come here to trade are forced to go aſhore in canoes. The earth here is very proper to make bricks; the oyſters, when burnt, afford good lime; and there is timber in great abundance; ſo that here are all the materials for building. The country at Anamaboa is full of hills, beginning at a good diſtance from the town, and affording a very pleaſant proſpect. Indian corn and palm-wine are in great plenty. They have a green fruit called *papas*, as big as a ſmall melon, and which has a taſte like cauliflower. Anamaboa is much frequented by the Engliſh ſhips and others for corn and ſlaves, which laſt are ſometimes to be had in great numbers. The Engliſh fort is built on the foundation of a large old houſe, which ſubſiſted entire in 1679. It is a large edifice, flanked by two towers, and fortified towards the ſea with two baſtions; the whole of brick and ſtone cemented with lime. It ſtands upon a rock, at the diſtance of 30 paces from the ſea. It is mounted with 12 pieces of cannon and 12 patereroes; and defended by a garriſon of 12 whites and 18 blacks, under the command of the chief factor.

The natives treat the garriſon of this fort with great inſolence, inſomuch as often to block them up, and frequently, if they diſlike the governor, ſend him off in a canoe to Cape Coaſt with marks of the utmoſt contempt. Far from being able to oppoſe them, the Engliſh are glad to obtain their favour with preſents. In 1701, they declared war againſt the Engliſh; and having aſſembled in a tumultuous manner before the fort, they ſet fire to the exterior buildings, and went on with their outrages, till they were diſperſed by a diſcharge of the cannon from the batteries. The night following the Engliſh took their revenge, by ſetting fire to the town of Anamaboa; and thus hoſtilities continued for 20 days, till at laſt the natives were obliged to ſue for peace. This fort was abandoned in 1733; but has been reſumed by the Engliſh, who have continued in it ever ſince.

ANAMELECH, an idol of the Sepharvaites, who are ſaid in Scripture to have burned their children in honour of Adrammelech and Anamelech.—Theſe idols probably ſignified the ſun and moon. Some of the rabbins repreſent Anamelech under the figure of a mule, others under that of a quail or pheaſant.

ANAMIM, the ſecond ſon of Mizraim (Gen. x. 13.) Anamim, if we may credit the paraphraſt Jonathan the ſon of Uzziel, peopled the Mareotis; or the Pentapolis of Cyrene, according to the paraphraſt of Jeruſalem. Bochart is of opinion that theſe Anamims were the people that dwelt in the parts adjacent to the temple of Jupiter Ammon, and in the Naſamonitis. Calmet thinks the Amanians and Garmantes to be deſcended from Anamim.

ANAMORPHOSIS, in perſpective drawings, is a deformed or diſtorted portrait or figure, generally confuſed and unintelligible to the common unaſſiſted view; but when ſeen at a certain diſtance and height, or as reflected from a plain or curved mirror, will appear regular and in right proportion. See OPTICS (the *Index*), and PERSPECTIVE.

ANANAS, in botany, the trivial name of a ſpecies of bromelia. See BROMELIA.

ANANCITIS, in antiquity, a kind of figured ſtone, otherwiſe called *ſynochitis*, celebrated for its magical virtue of raiſing the ſhadows of the infernal gods.

ANANIAS, a Sadducee, high-prieſt of the Jews, who put to death St James the brother of our Lord, and was depoſed by Agrippa.

ANANISABTA, or ANANISAPTA, a magical word frequently found inſcribed on coins and other amulets, ſuppoſed to have a virtue of preſerving the wearer from the plague.

ANAPÆST, in ancient poetry, a foot conſiſting of two ſhort ſyllables and one long: Such is the word ſcŏpŭlōs. It is juſt the reverſe of the dactyl.

ANAPÆSTIC VERSES, thoſe conſiſting wholly or chiefly of anapeſts.

ANAPHE (anc. geog.), an iſland ſpontaneouſly emerging out of the Cretan ſea, near Thera (Pliny, Strabo); now called *Nanſio*. Its name is from the ſudden appearance of the new moon to the Argonauts in a ſtorm (Apollonius), *Anaphæus*, an epithet of Apollo, who was worſhipped there. *Anaphæi*, the people.

ANAPHORA, in rhetoric, the repetition of the ſame word or words in the beginning of a ſentence or verſe: Thus Virgil,

> *Pan etiam Arcadia mecum ſi judice certet,*
> *Pan etiam Arcadia dicat ſe judice victum.*

ANAPHORA, among phyſicians, the throwing off purulent matter by the mouth.

ANAPHRODISIA, ſignifies impotence, or want of power to procreate. See IMPOTENCE.

ANAPLASIS, ſignifies the replacing or ſetting a fractured bone.

ANAPLORETICS, medicines that promote the growth or granulation of the fleſh in wounds, ulcers, &c.

ANARCHI, Αναρχοι, in antiquity, a name given by the Athenians to four ſupernumerary days in their year, during which they had no magiſtrates. The Attic year was divided into ten parts, according to the number of tribes, to whom the precedency of the ſenate fell by turns. Each diviſion conſiſted of 35 days; what remained after the expiration of theſe, to make the lunar year complete, which according to their computation conſiſted of 354 days, were employed in the creation of magiſtrates, and called αναρχοιη μεραι, and αρχαιρεσνοι.

ANARCHY, the want of government in a nation, where no ſupreme authority is lodged, either in the prince or other rulers; but the people live at large, and all things are in confuſion. The word is derived from the Greek privative α, and αρχη, *command, principality*. Anarchy is ſuppoſed to have reigned after the deluge, before the foundation of monarchies. We ſtill find it obtain in ſeveral parts, particularly of Africa and America.

ANARCHY is alſo applied to certain troubleſome and diſorderly periods, even in governments otherwiſe regular. In England, the period between the death of Cromwell and King Charles's reſtoration is commonly repreſented as an *anarchy*. Every month produced a new ſcheme or form of government. Enthuſiaſts talked of nothing but annulling all the laws, aboliſhing all writings, records, and regiſters, and bringing all men to the primitive level. No modern nation is more ſubject to anarchies than Poland; where every interval between the death of one king and the election of another is a perfect picture of confuſion, inſomuch that it is a proverb among that people, *Poland is governed by confuſion*. The Jewiſh hiſtory preſents numerous inſtances of anarchies in that ſtate, uſually denoted by this phraſe, that *in thoſe days there was no king in Iſrael, but every man did that which was right in his own eyes*; which is a juſt picture of an *anarchy*.

ANARRHICAS, in ichthyology, a genus of fiſhes of the order of apodes. There is but one ſpecies of this genus, viz. the anarrhicas lupus, or ſea-wolf; which ſeems to be confined to the northern parts of the globe. We find it in the ſeas of Greenland; in thoſe of Iceland and Norway; on the coaſts of Scotland and of Yorkſhire; and laſtly, in that part of the German ocean which waſhes the ſhores of Holland, the moſt ſouthern of its haunts that we can with any certainty mention.

It is a moſt ravenous and fierce fiſh, and, when taken, faſtens on any thing within its reach: the fiſhermen, dreading its bite, endeavour as ſoon as poſſible to beat out its fore-teeth, and then kill it by ſtriking it behind the head. Schonevelde relates, that its bite is ſo hard, that it will ſeize on an anchor, and leave the marks of its teeth in it; and the Daniſh and German names of *ſteenbider* and *ſteinbeiſſer*, expreſs the ſenſe of its great ſtrength, as if it was capable of cruſhing even ſtones with its jaws.

It feeds almoſt entirely on cruſtaceous animals and ſhell-fiſh, ſuch as crabs, lobſters, prawns, muſcles, ſcollops, large whelks, &c. theſe it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells. It does not appear they are diſſolved in the ſtomach, but are voided with the fæces; for which purpoſe the aperture of the anus is wider than in other fiſh of the ſame ſize. It is full of roe in February, March, and April, and ſpawns in May and June.

This fiſh has ſo diſagreeable and horrid an appearance that nobody at Scarborough, except the fiſhermen, will eat it, and they prefer it to holibut. They always, before dreſſing, take off the head and ſkin.

The ſea-wolf grows to a large ſize: thoſe on the Yorkſhire coaſt are ſometimes found of the length of four feet; according to Dr Gronovius, they have been taken near Shetland ſeven feet long, and even more.

The head is a little flatted on the top; the noſe blunt; the noſtrils are very ſmall; the eyes ſmall, and placed near the end of the noſe.

The teeth are very remarkable, and finely adapted to its way of life. The fore-teeth are ſtrong, conical, diverging a little from each other, ſtand far out of the jaws, Encyclopædia.

V1. Tit Anas - The Tadorna or Shell-drake, has a flat bill, a compreſsed forehead, and the body is variegated with White. This species is found as far as Ice-land to the North.

jaws, and are commonly ſix above and the ſame below, though ſometimes they are only five in each jaw: theſe are ſupported within-ſide by a row of leſſer teeth, which makes the number in the upper jaw 17 or 18, in the lower 11 or 12. The ſides of the under jaw are convex inwards, which greatly adds to their ſtrength, and at the ſame time allows room for the large muſcles with which the head of this fiſh is furniſhed. The *dentes molares*, or grinding-teeth of the under jaw, are higher on the outer than the inner edges, which inclines their ſurfaces inward: they join to the canine teeth in that jaw, but in the upper are ſeparate from them. In the centre are two rows of flat ſtrong teeth, fixed on an oblong baſis upon the bones of the palate and noſe.

The teeth of the anarrhicas are often found foſſil; and in that ſtate called *bufonites*, or *toad-ſtones*: theſe were formerly much eſteemed for their imaginary virtues, and were ſet in gold, and worn as rings.

The two bones that form the under jaw are united before by a looſe cartilage; which mechaniſm admitting of a motion from ſide to ſide, moſt evidently contributes to the deſign of the whole, viz. a facility of breaking, grinding, and comminuting, its teſtaceous and cruſtaceous food. At the entrance of the gullet, above and below, are two echinated bones: theſe are very ſmall, being the leſs neceſſary, as the food is in a great meaſure comminuted in the mouth by aid of the grinders.

The body is long, and a little compreſſed ſidewiſe; the ſkin ſmooth and ſlippery: it wants the lateral line. The pectoral fins conſiſt of 18 rays. The dorſal fin extends from the hind-part of the head almoſt to the tail; the rays in the freſh fiſh are not viſible. The anal fin extends as far as the dorſal fin. The tail is round at its end, and conſiſts of 13 rays. The ſides, back, and fins, are of a livid lead colour; the two firſt marked downwards with irregular obſcure duſky lines: theſe in different fiſh have different appearances. The young are of a greeniſh caſt, reſembling the ſea-wreck, amongſt which they reſide for ſome time after their birth.

ANARROPIA, among phyſicians, a tendency of the humours to the head or ſuperior parts.

ANAS (anc. geog.), a river of Spain, riſing in the territory of Laminium, of the Hither Spain, and now ſpreading into lakes, again reſtraining its waters, or, burrowing itſelf entirely in the earth, is pleaſed often to reappear; it pours into the Atlantic (Pliny); now *Guadiana*, riſing in the ſouth-eaſt of New-Caſtile, in a diſtrict commonly called Campo de Montiel, not far from the mountain Conſuegra, from the lakes called *las Lagunas de Guadiana*, and then it is called *Rio Roydera*; and, after a courſe of ſix leagues, burying itſelf in the earth for a league, it then riſes up again from three lakes, called *los Ojos de Guadiana*, near the village Villa Harta, five leagues to the north of Calatrava, and directs its courſe weſtward through New Caſtile, by Medelin, Merida, and Badajox, where it begins to bend its courſe ſouthwards, between Portugal and Andaluſia, falling into the bay of Cadiz near Ayamonte.

ANAS, in ornithology, a genus of birds belonging to the order of anſeres. The beak of this genus is a little obtuſe, covered with an epidermis or ſkin, gibbous at the baſe and broad at the apex: the tongue is obtuſe and fleſhy; the feet are webbed and fitted for ſwimming. The ſpecies are,

1. The cygnus, *ferus & manſuetus*.

α. The *ferus*, with a ſemicylindrical black bill, yellow wax, and a white body, is the whiſtling or wild ſwan of Engliſh authors, and is leſs than the tame or mute ſpecies, being about five feet in length. Theſe birds inhabit the northern world as high as Iceland, and as low as the ſoft climate of Greece or of Lydia, the modern Anatolia, in Aſia Minor: it even deſcends as low as Egypt. They ſwarm, during ſummer, in the great lakes and marſhes of the Tartarian and Siberian deſarts; and reſort in great numbers to winter about the Caſpian and Euxine ſeas. Thoſe of the eaſtern parts of Siberia retire beyond Kamtſchatka, either to the coaſts of America, or to the iſles north of Japan. In Siberia they ſpread far north, but not to the Arctic circle. They arrive in Hudſon's Bay about the end of May, where they breed in great numbers on the ſhores, in the iſlands, and in the inland lakes; but all retire to the ſouthern parts of North-America in autumn, even as low as Carolina and Louiſiana. In Carolina they are ſaid to be of two ſorts; the larger, called from its note the *Trumpeter*, arrive in great flocks to the freſh rivers in winter, and in February retire to the great lakes to breed: the leſſer are called *Hoopers*, and frequent moſtly the ſalt water. The Indians of Louiſiana wear the ſkins, with the down attached to them, ſewed together by way of covering; and of the larger feathers they make diadems for their chiefs, as well as weave the ſmaller on threads, as barbers do their wigs, with which they cover garments, which are worn only by women of the higheſt rank. In Auguſt theſe birds loſe their feathers, and are not able to fly; when the natives of Iceland and Kamtſchatka hunt them with dogs, which catch them by the neck, and eaſily ſecure their prey. In the laſt place they are alſo killed with clubs. The eggs are accounted good food; and the fleſh, eſpecially that of the young, is much eſteemed by the inhabitants. The uſes of the feathers are manifeſt to every one; and the ſkins of the body are worn by the inhabitants; beſides which, that of the legs, taken off whole, is uſed for purſes, and appears not unlike ſhagreen. Wild ſwans, Linnæus ſays, frequently viſit Sweden after a thaw, and are caught with apples in which a hook is concealed. The wild ſwan frequents the coaſts of Great Britain, in hard winters, in large flocks, but does not breed there. Martin * acquaints us, that ſwans come in October in great number to Lingey, one of the Weſtern iſles; and continue there till March, when they return northward to breed. A few continue in Mainland, one of the Orkneys, and breed in the little iſles of the freſh-water lochs: but the multitude retires at the approach of ſpring. On that account, ſwans are there the country-man's almanack: on their quitting the iſle, they preſage good weather; on their arrival, they announce bad. Theſe, as well as moſt other water-fowl, prefer, for the purpoſe of incubation, thoſe places that are leaſt frequented by mankind: accordingly we find that the lakes and foreſts of the diſtant Lapland are filled during ſummer with myriads of water-fowl; and there ſwans, geeſe, the duck-tribe, gooſanders, divers, &c. paſs that ſeaſon; but in autumn return to other, more hoſpitable, ſhores.

* *Deſcript. Weſt. Iſles*, 71.

This ſpecies has ſeveral diſtinctions from the ſpecies which in Britain is called the *tame ſwan*. In Ruſſia this ſpecies more fitly claims the name, it being the kind moſt commonly tamed in that empire. The whiſtling ſwan carries its neck quite erect, the other ſwims with it arched. This is far inferior in ſize. This has twelve ribs on a ſide, the mute only eleven. But the moſt remarkable is the ſtrange figure of the windpipe; which falls into the cheſt, then turns back like a trumpet, and afterwards makes a ſecond bend to join the lungs. Thus it is enabled to utter a loud and ſhrill note. The other ſwan, on the contrary, is the moſt ſilent of birds: it can do nothing more than hiſs, which it does on receiving any provocation. The vocal kind emits its loud notes only when flying or calling. Its ſound is, *whooh, whooh*, very loud and ſhrill, but not diſagreeable, when heard far above one's head and modulated by the winds. The natives of Iceland compare it to the notes of a violin. In fact, they hear it (ſays Mr Pennant) at the end of their long and gloomy winter, when the return of the ſwans announces the return of ſummer; every note muſt be therefore melodious which preſages the ſpeedy thaw, and the releaſe from their tedious confinement.

It is from this ſpecies alone that the ancients have given the fable of the ſwan being endued with the powers of melody. Embracing the Pythagorian doctrine, they made the body of this bird the manſion of the ſouls of departed poets; and after that, attributed to the birds the ſame faculty of harmony which their inmates poſſeſſed in a pre-exiſtent ſtate. The vulgar, not diſtinguiſhing between ſweetneſs of numbers and melody of voice, thought that real which was only intended figuratively. The mute ſwan, Mr Pennant obſerves, never frequents the Padus, nor is ever ſeen on the Cayſter in Lydia; each of them ſtreams celebrated by the poets for the great reſort of ſwans.

In time, a ſwan became a common trop for a *bard*. Horace calls Pindar *Dircæum Cygnum*; and in one ode even ſuppoſes himſelf changed into a ſwan. Virgil ſpeaks of his poetical brethren in the ſame manner:

> *Vare*, tuum nomen
> Cantantes ſublime ferent ad ſidera cygni. *Eclog.* ix.

When he ſpeaks of them figuratively, he aſcribes to them melody, or the power of muſic; but when he talks of them as birds, he lays aſide fiction, and, like a true naturaliſt, gives them their real note:

> Dant ſonitum *rauci* per ſtagna loquacia cygni.
> *Æneid.* Lib. xi. 458.

It was alſo a popular opinion among the ancients, that the ſwan foretold its own end. To explain this, we muſt conſider the twofold character of the poet, *vates* and *poeta*, which the fable of the tranſmigration continues to the bird, or they might be ſuppoſed to derive that faculty from Apollo their patron deity, the god of prophecy and divination.

As to their being ſuppoſed to ſing more ſweetly at the approach of death, the cauſe is beautifully explained by Plato, who attributes that unuſual melody to the ſame ſort of ecſtaſy that good men are ſometimes ſaid to enjoy at that awful hour, foreſeeing the joys that are preparing for them on putting off mortality.

β, The *manſuetus*, or mute ſwan, is the largeſt of the Britiſh birds. It is diſtinguiſhed externally from the wild ſwan; firſt, by its ſize, being much larger; ſecondly, by its bill, which in this is red, and the tip and ſides black, and the ſkin between the eyes and bill is of the ſame colour. Over the baſe of the upper mandible, projects a black callous knob; the whole plumage, in old birds, is white; in young ones, aſh-coloured till the ſecond year: the legs are duſky; but Dr Plott mentions a variety found on the Trent near Rugely, with red legs.

The ſwan is found wild in Ruſſia and Siberia, moſt plentiful in the laſt. It arrives later from the ſouth, and does not ſpread ſo far north. Thoſe about the ſouthern part of the Caſpian Sea are very large, and much eſteemed for the uſe of the table. The ſwan is held in high veneration by the Mahometans. It is a very ſtrong bird, and ſometimes exceeding fierce: has not unfrequently been known to throw down and trample under feet youths of fifteen or ſixteen years of age, and an old one to break the leg of a man with a ſtroke of the wings. It is ſaid to be very long-lived, and frequently to arrive at the hundredth year. The young are not perfect in plumage till the ſecond year. The ſwan lays the firſt egg in February, and continues laying every other day to the amount of ſix, ſeven, or eight eggs; theſe it places on a bed of graſs near the water, and ſits ſix weeks. It feeds on both fiſh and herbage.

No bird, perhaps, makes ſo inelegant a figure out of the water, or has the command of ſuch beautiful attitudes on that element, as the ſwan: almoſt every poet has taken notice of it; but none with that juſtneſs of deſcription, and in ſo picturesque a manner, as Milton:

> The ſwan, with arched neck
> Between her white wings mantling, proudly rows
> Her ſtate with oary feet. *Par. Loſt*, B. vii.

In former times, it was ſerved up at every great feaſt, when the elegance of the table was meaſured by the ſize and quantity of the good cheer. Cygnets are to this day fattened at Norwich about Chriſtmas, and are ſold for a guinea a-piece.

Swans were formerly held in ſuch great eſteem in England, that by an act of Edward IV. c. 6. "no one that poſſeſſed a freehold of leſs clear yearly value than five marks, was permitted to keep any, *other than the ſon of our ſovereign lord the king*." And by the eleventh of Henry VII. c. 17. the puniſhment for taking their eggs was impriſonment for a year and a day, and a fine at the king's will. Though at preſent they are not ſo highly valued as a delicacy, yet great numbers are preſerved for their beauty; multitudes are to be ſeen on the Thames and Trent, but no where greater numbers than on the ſalt-water inlet of the ſea near Abbotſbury in Dorſetſhire.

2. The cygnoides, with a ſemicylindrical bill, gibbous wax, and tumid eye-brows. It is the ſwan-gooſe of Ray, from Guinea. There is likewiſe a variety of this ſpecies, of a leſs ſize, called the *gooſe of Muſcovy*. They are found wild about the Lake Baikal in the eaſt of Siberia, and in Kamtſchatka. They are alſo kept tame in moſt parts of the Ruſſian empire. Theſe birds likewiſe inhabit China, and are common at the Cape of Good Hope. This is no doubt the ſpecies

mentioned by Kolben, called *crop-gooſe;* who ſays, that the ſailors make tobacco-pouches and purſes of the membrane which hangs beneath the throat, as it is ſufficiently tough for ſuch purpoſes, and will hold two pounds of tobacco.

They are ſufficiently common in Britain, and readily mix with the common gooſe; the breeds uniting as freely, and continuing to produce as certainly, as if no ſuch mixture had taken place. They are much more noiſy than the common tame geeſe, taking alarm at the leaſt noiſe; and even without diſturbance will emit their harſh and diſagreeable ſcream the whole day through. They walk very erect, with the neck much elevated; and as they bear a middle line between that of the ſwan and gooſe, they have not improperly been called *ſwan-gooſe.*

3. The tadorna, or ſhelldrake, has a flat bill, a compreſſed forehead, a greeniſh black head, and the body is variegated with white. This ſpecies is found as far as Iceland to the north. It viſits Sweden and the Orkneys in the winter, and returns in Spring. It is found in Aſia about the Caſpian Sea, and all the ſalt lakes of the Tartarian and Siberian deſarts, as well as in Kamtſchatka. Late voyagers, if right in the ſpecies, have alſo met with it at Falkland Iſles and Van Diemen's Land. It breeds in deſerted rabbit holes, or occupies them in the abſence of the owners, who, rather than make an attempt at diſlodging the intruders, form others; though, in defect of ready-made quarters, theſe birds will frequently dig holes for themſelves. They lay fifteen or ſixteen roundiſh white eggs. Theſe are placed at the farther end of the hole, covered with down ſupplied from the breaſt of the female, who ſits about 30 days. She is very careful of her young, and will often carry them from place to place in her bill: "this we are certain of (ſays Mr Mr Latham), from a young one having been dropt at the foot of an intelligent friend unhurt, by the mother flying over his head." When a perſon attempts to take their young, the old birds ſhow great addreſs in diverting his attention from the brood: they will fly along the ground as if wounded, till the former are got into a place of ſecurity, and then return and collect them together. From this inſtinctive cunning, Turner, with good reaſon, imagines them to be the *chenalopex,* or *fox-gooſe,* of the ancients. The natives of the Orkneys to this day call them the *ſly-gooſe,* from an attribute of that quadruped.

The young, as ſoon as hatched, take to the water, and ſwim ſurpriſingly well; but do not come to their full plumage till the ſecond year. This ſpecies, Mr Latham informs us, may he hatched under a tame duck, and the young readily brought up; but are apt, after a few years, to attempt the maſtery over the reſt of the poultry. In a ſtate of nature their food ſeems chiefly to be ſmall fiſh, marine inſects, and ſhells; herbage has likewiſe been found in their ſtomachs. In a tame ſtate will eat bread, grain, and greens. Their great beauty would tempt us to endeavour at domeſticating the race; but it will not thrive completely, except in the neighbourhood of ſalt water, which ſomehow ſeems eſſential to its well-being. The fleſh likewiſe is rank and unſavoury, though the eggs have at all times been thought very good.

4. The ſpectabilis, has a compreſſed bill, gibbous at the baſe, a black feathery carina, and a hoary head. It is the grey-headed duck of Edwards, and the king-duck of Pennant. This beautiful ſpecies is found at Hudſon's Bay, at Churchill River, and (though ſcarce) at York Fort; in winter it is met with as far ſouth as New-York. It is pretty frequent in the north of Siberia and Kamtſchatka; it is found alſo on the coaſt of Norway, and has been killed in the Orkneys. It is common in Greenland; where the fleſh is accounted excellent, and the crude gibbous part of the bill a great delicacy. It produces a down equally valuable as the eider. The ſkins are ſewed together, and make warm garments. The natives kill them with darts, and uſe the following method to ſucceed:—A number of men in canoes falling in with a flock while ſwimming, on a ſudden ſet up a ſhouting, making as much noiſe as they can; on which, the birds being too much frightened to fly away, dive under the water; but as the place at which they are to riſe again is known by the bubbling of the water above, the hunters follow them up as cloſe as may be; and after acting this three or four times over, the birds become ſo fatigued as to be eaſily killed.—This ſpecies builds on the ſides of ponds and rivers, making its neſt of ſticks and moſs, and lining it with feathers from the breaſt. It lays four or five whitiſh eggs, as large as thoſe of the gooſe. The young fly in July. The food conſiſts chiefly of worms and graſs.

5. The fuſca, or velvet duck, is of a blackiſh colour, has a white ſpot behind the eyes, and a white line on the wings. The male of this ſpecies is diſtinguiſhed by a gibboſity at the baſe of the bill. It is the black duck of Ray, and is in length about 20 inches. This ſpecies frequents Hudſon's Bay in ſummer, where it breeds. The neſt is compoſed of graſs; in which it lays from four to ſix white eggs, and hatches in July. It feeds on graſs, and is known by the names of *cus cuſi qua tum.* It retires ſouth in winter: when it is frequently ſeen as far ſouth as New-York. Our late navigators met with it at Aoonalaſhka. It is now and then ſeen on the coaſts of England, but is not common. It is more frequent on the continent, inhabiting Denmark and Ruſſia. In ſome parts of Siberia it is very common; and it enters the liſt of thoſe found at Kamtſchatka. In breeding-time, it goes far inland to lay the eggs; which are eight or ten in number, and white. After the ſeaſon is over, the males are ſaid to depart; the females ſtaying behind till the young are able to fly, when the two laſt go likewiſe off, but to what part is not certain. It is in great plenty at Ochotſka, eſpecially about the equinox. Fifty or more of the natives go in boats and ſurround the whole flock, driving them into the flood of the river Ochotſka: and, as ſoon as it ebbs, the whole company fall on them at once with clubs, and often knock ſo many of them on the head that each man has 20 or 30 for his ſhare.

6. The nigra, or ſcoter, is totally black, and has a gibboſity at the baſe of the bill; the tail reſembles a wedge; the female is browniſh. It is the leſſer black diver of Ray, and meaſures in length 22 inches. Theſe birds are found on the northern coaſts of England and thoſe of Scotland in the winter ſeaſon; but no where ſo common as on the French coaſts, where they are ſeen in prodigious numbers from November to March,

eſpecially if the wind be to the north or north-weſt. Their chief food is a glaſſy bivalve ſhell, near an inch long, called by the French *vaimeaux*. Theſe they are perpetually diving after, frequently to the depth of ſome fathoms; and an uſual method of catching them is by placing nets under the water in ſuch places as the ſhells are moſt numerous; by which means 30 or 40 dozen of them have been taken in one tide. The day ſeems to be ſpent by theſe birds between diving and flying to ſmall diſtances over the water, which it does ſo low as frequently to dip the legs therein. It ſwallows the food whole, and ſoon digeſts the ſhells, which are found quite crumbled to powder among the excrements. It has been kept tame for ſome time, and will feed on ſoaked bread. The fleſh taſtes fiſhy to an extreme; on which account it is allowed by the Roman-Catholics to be eaten on faſt days and in lent; and indeed muſt be a ſufficient mortification.—Theſe birds abound in all the northern parts of the continent, Lapland, Sweden, Norway, and Ruſſia; and are found in great plenty on the great lakes and rivers on the north and eaſt of Siberia, as well as on the ſea ſhores. It likewiſe inhabits North-America; being met with at New-York; and in all probability much more to the north on this continent and that of Aſia, Oſbeck having met with them in 30 and 34 degrees ſouth latitude, between the iſland of Java and St Paul, in the month of June.

7. The anſer, *feres et manſuetus;* or grey lag, and tame gooſe. The *grey lag* or *wild gooſe*, is two feet nine inches in length, and five feet in extent. The bill is large and elevated; of a fleſh colour, tinged with yellow; the head and neck cinereous; breaſt and belly whitiſh, clouded with grey or aſh colour; back, grey; the legs of a fleſh colour. This ſpecies reſides in the fens the whole year; breeds there, and hatches about eight or nine young, which are often taken, eaſily tamed, and eſteemed moſt excellent meat, ſuperior to the domeſtic gooſe. Towards winter they collect in great flocks, but in all ſeaſons live and feed in the fens. On the continent they are migratory, changing place in large flocks, often 500 or more: in this caſe, the flock is triangular in ſhape, with one point foremoſt; and as the gooſe which is firſt is tired ſooneſt, it has been ſeen to drop behind, and another to take his place. In very ſmall flocks, however, they are ſometimes ſeen to follow one another in a direct line. Geeſe ſeem to be general inhabitants of the globe.

The *manſuetus*, is the grey lag in a ſtate of domeſtication, and from which it varies in colour, though much leſs ſo than either the mallard or cock, being ever more or leſs verging to grey; though in all caſes the whiteneſs of the vent, and upper tail coverts, is manifeſt. It is frequently found quite white, eſpecially the males; and doubts have ariſen, which of the two colours ſhould have the preference in point of eating.—Tame geeſe are kept in great multitudes in the fens of Lincolnſhire, in England; a ſingle perſon will have 1000 old geeſe, each of which will rear ſeven; ſo that towards the end of the ſeaſon he will become poſſeſſed of 8000. During the breeding-ſeaſon theſe birds are lodged in the ſame houſe with the inhabitants, and even in their very bed-chambers: in every apartment are three rows of coarſe wicker pens, placed one above another; each bird has its ſeparate lodge divided from the other, which it keeps poſſeſſion of during the time of ſitting. A perſon called a *gozzard*, i. e. *gooſe-herd*, attends the flock, and twice a-day drives the whole to water; then brings them back to their habitations, helping thoſe that live in the upper ſtories to their neſts, without ever miſplacing a ſingle bird. The geeſe are plucked five times in the year: the firſt plucking is at Lady-day, for feathers and quills; the ſame is renewed, for feathers only, four times more between that and Michaelmas. The old geeſe ſubmit quietly to the operation, but the young ones are very noiſy and unruly. If the ſeaſon proves cold, numbers of them die by this barbarous cuſtom. Vaſt numbers of geeſe are driven annually to London, to ſupply the markets; among them, all the ſuperannuated geeſe and ganders, which, by a long courſe of plucking, prove uncommonly tough and dry.

The gooſe in general breeds only once in a year; but will frequently have two hatches in a ſeaſon, if well kept. The time of ſitting is about 30 days. They will alſo produce eggs ſufficient for three broods, if they are taken away in ſucceſſion. It is ſaid to be very long-lived, as we have authority for their arriving at no leſs than 100 years.

8. The *bean gooſe* is two feet ſeven inches in length; in extent four feet eleven. The bill, which is the chief diſtinction between this and the former, is ſmall, much compreſſed near the end, whitiſh, and ſomewhat pale red in the middle, and black at the baſe and nail: the head and neck are cinereous brown, tinged with ferruginous; breaſt and belly dirty white, clouded with cinereous; the back of a pale aſh colour; feet and legs of a ſaffron colour; claws black. This ſpecies arrives in Lincolnſhire in autumn; and is called the *bean-gooſe*, from the likeneſs of the nail of the bill to a horſe-bean. They always light on corn-fields, and feed much on the green wheat. They never breed in the fens; but all diſappear in May. They retreat to the ſequeſtered wilds of the north of Europe; in their migration they fly a great height, cackling as they go. They preſerve a great regularity in their motions; ſometimes forming a ſtraight line; at others, aſſuming the ſhape of a wedge, which facilitates their progreſs, for they cut the air readier in that form than if they flew pell-mell.

9. The erythropus, or laughing gooſe of Edwards, is a native of Europe and America. The length of this ſpecies is about two feet four, the extent four feet ſix; the bill is elevated, of a pale yellow colour, with a white ring at the baſe; the forehead is white; the breaſt and belly are of a dirty white, marked with great ſpots of black; and the legs yellow. Theſe viſit the fens and other parts of England during winter, in ſmall flocks; they keep always in marſhy places, and never frequent the corn-lands. They diſappear in the earlieſt ſpring, and none are ſeen after the middle of March. Linnæus makes this gooſe the female of the *bernacle;* but Mr Pennant thinks his opinion not well founded.

The *bernacle* (erythropus *mas* Lin.) is two feet one inch in length, the breadth four feet five inches: the bill is black; the forehead and cheeks are white; from the bill to the eyes, there is a black line; the hind part of the head, the whole neck, and upper part of the breaſt and back, are of a deep black; the tail is black, the legs are of the ſame colour, and ſmall. Thoſe birds appear in vaſt flocks during winter, on the north-weſt coaſts of Great-Britain: they are very ſhy and wild; but on being taken, grow in a few days as familiar as our tame geeſe. In February they retire as far as Lapland, Greenland, and even Spitzbergen, to breed. They live to a great age: the Rev. Dr Buckworth of Spalding, had one which was kept in the family above 32 years, but was blind during the two laſt; what its age was when firſt taken, was unknown.

Theſe are the birds that about 200 years ago were believed to be generated out of wood, or rather a ſpecies of ſhell that is often found ſticking to the bottoms of ſhips, or fragments of them; and were called *tree-geeſe* *. Theſe were alſo thought by ſome writers to have been the *chenalopeces* of Pliny; they ſhould have ſaid *chenerotes*, for thoſe were the birds which that naturaliſt ſaid were found in Britain: but as he has ſcarce left us any deſcription of them, it is difficult to ſay which ſpecies he intended. Mr Pennant imagines it to be the following; which is far inferior in ſize to the wild-gooſe, and very delicate food, in both reſpects ſuiting his deſcription of the *cheneros*.

10. The race-horſe or loggerhead gooſe, is in length 32 inches, and weighs from 20 to 30 pounds. The bill is three inches long, and of an orange colour: the irides are orange, ſurrounded with black, and then with orange: the head, neck, and upper parts of the body are of a deep aſh-colour; the outer edge of the ſecondaries white, forming a band of the ſame on the wing: the under parts of the body duſky down the middle; over the thighs cinereous blue; vent white; quills and tail black: the wings are very ſhort, not reaching to the rump: on the bend of the wing is a yellow knob, half an inch in length; the legs are browniſh orange, the webs duſky, and the claws black. Theſe inhabit Falkland Iſlands, Staaten Land, &c. and were moſtly ſeen in pairs, though ſometimes they were obſerved in large flocks. From the ſhortneſs of their wings they were unable to fly; but they made conſiderable uſe of them when in the water, on which they ſeemed as it were to run, at leaſt they ſwam, with the aſſiſtance of the wings uſed as oars, at an incredible rate, inſomuch that it was a moſt difficult thing to ſhoot them while on that element: to catch them, the ſailors uſed to ſurround a flock with boats, and drive them on ſhore; where, unable to raiſe themſelves from the ground, they ran very faſt, but ſoon growing tired, and ſquatting down to reſt, were readily overtaken, and knocked on the head. Their fleſh was ſometimes eaten by the ſailors, in defect of that of the buſtard gooſe; but it was not much reliſhed, being rank and fiſhy, and thought more fit for the hogs, which ate it greedily, and fatted well upon it, boiled.

11. The ſnow-gooſe is in length two feet eight inches, and weighs between five and ſix pounds. The bill is ſomewhat ſerrated at the edges; the upper mandible ſcarlet, the lower whitiſh: the general colour of the plumage is ſnow white, except the firſt ten quills, which are black, with white ſhafts: the legs are of a deep red. The young are of a blue colour, till they are a year old. Theſe are very numerous at Hudſon's-Bay, and called by the natives *Way-way* and *Wapa whe whe*. They viſit Severn River in May, and ſtay a fortnight; but go farther north to breed: they return to Severn-Fort the beginning of September, and ſtay to the middle of October, when they depart for the ſouth, and are obſerved to be attended with their young, in flocks innumerable. At this time many thouſands are killed by the inhabitants; who pluck them, and take out the entrails, and putting the bodies into holes dug in the ground cover them with earth, which freezing above them, keeps them perfectly ſweet throughout the ſevere ſeaſon; during which there is no more to do than occaſionally to open one of thoſe ſtorehouſes, when they find them ſweet and good. They ſeem to occupy alſo the weſtern ſide of America. In the ſummer months, they are plenty on the arctic coaſt of Siberia, but never migrate beyond longitude 130. They are ſuppoſed to paſs the winter in more moderate climes, as they have been ſeen flying at a great height over Sileſia; probably on their paſſage to ſome other country, as it does not appear that they continue there. In like manner, thoſe of America paſs the winter in Carolina. Here they arrive in vaſt flocks; and feed on the roots of ſage and graſs, which they tear up like hogs. It uſed to be a common practice in that country to burn a piece of a marſh, which enticed the geeſe to come there, as they could then more readily get at the roots, which gave the ſportſman opportunity of killing as many as he pleaſed. This ſpecies is the moſt numerous and the moſt ſtupid of all the gooſe race. They ſeem to want the inſtinct of others, by their arriving at the mouths of the Arctic Aſiatic rivers before the ſeaſon in which they can poſſibly ſubſiſt. They are annually guilty of the ſame miſtake, and annually compelled to make a new migration to the ſouth in queſt of food, where they paſs their time till the northern eſtuaries are freed from the bonds of ice. They have ſo little of the ſhyneſs of other geeſe, that they are taken in the moſt ridiculous manner imaginable about Jakut, and the other parts of Siberia, which they frequent. The inhabitants firſt place, near the banks of the rivers, a great net, in a ſtraight line, or elſe form a hovel of ſkins ſewed together. This done, one of the company dreſſes himſelf in the ſkin of a white reindeer, advances towards the flock of geeſe, and then turns back towards the net or the hovel; and his companions go behind the flock, and by making a noiſe drive them forward. The ſimple birds miſtake the man in white for their leader, and follow him within reach of the net, which is ſuddenly pulled down and captivates the whole. When he chooſes to conduct them to the hovel, they follow in the ſame manner; he creeps in at a hole left for that purpoſe, and out at another on the oppoſite ſide, which he cloſes up. The geeſe follow him through the firſt; and as ſoon as they are got in, he paſſes round, and ſecures every one.

12. The great gooſe is of a very large ſize, weighing near 25 or 30 Ruſſian pounds. The bill is black; baſe of it tawny: body duſky; the under parts are white; the legs ſcarlet. It is found on the eaſt of Siberia, from the river Lena to Kamtſchatka; and is taken in great numbers.

13. The rucofilis, or red-breaſted gooſe, is in length 21 inches; weight three pounds troy. The bill is ſmall, and brown; the tail black; the irides are yellow brown; round the eyes fringed with brown; fore part of the head and crown black, paſſing backwards in a narrow ſtripe quite to the back; on the breaſt is a narrow band of white feathers with black ends form-

* See *Lepas*.

ing a band of white and another of black: the ſides are ſtriped with black: back and wings black, the laſt even with the tail: legs black. This moſt elegant of geeſe is found to breed from the mouth of the Ob, along the coaſts of the Icy ſea, to that of the Lena. Its winter quarters are not certainly known. Small flocks are obſerved in the ſpring flying from the Caſpian ſea along the Volga northward; and are ſeen about Zarizyn, between the ſixth and tenth of April. They reſt a little time on the banks of the Sarpa, but ſoon reſume their arctic courſe. Their winter retreat is probably in Perſia. They are highly eſteemed for the table, being quite free from any fiſhy taſte.

14. The caſarca, or ruddy-gooſe, is larger than a mallard, and ſeems even larger than it really is, from the length of wing, and ſtanding high on its legs. The bill is black: the irides are yellowiſh brown: forehead, cheeks, and throat, yellowiſh: fore part of the neck ferruginous, encircled with a collar of black, inclining to deep rufous on the throat: the breaſt and ſide are pale rufous; the belly is obſcure: the back is pale; the lower part is undulated, hoary, and brown, not very diſtinct; the rump and tail are greeniſh black; the legs long and black. This ſpecies is found in all the ſouthern parts of Ruſſia and Siberia in plenty. In winter it migrates into India, and returns northward in ſpring. It makes its neſt in the craggy banks of the Wolga and other rivers, or in the hollows of the deſerted hillocks of marmots; making it after the manner of the ſhelldrake, and is ſaid to form burrows for itſelf in the manner of that bird. It has been known alſo to lay in a hollow tree, lining the neſt with its own feathers. It is monogamous: the male and female ſit in turns. The eggs are like thoſe of the common duck. When the young come forth, the mother will often carry them from the place of hatching to the water with her bill. They have been attempted to be domeſticated, by rearing the young under tame ducks; but without ſucceſs, as they ever are wild, effecting their eſcape the firſt opportunity: or, if the old ones are taken and confined, they lay the eggs in a diſperſed manner, and never ſit. The voice is not unlike the note of a clarinet, while flying; at other times they cry like a peacock, eſpecially when kept tame; and now and then cluck like a hen. It is very choice of its mate; for if the male is killed, the female will not leave the gunner till ſhe has been two or three times ſhot at. The fleſh is thought very good food.

15. The bernicla is of a brown colour; with the head, neck, and breaſt, black; and a white collar. Theſe birds, like the bernacles, frequent the Britiſh coaſts in winter; and are particularly plenty, at times, on thoſe of Holland and Ireland, where they are taken in nets placed acroſs the rivers. In ſome dry ſeaſons they have reſorted to the coaſts of Picardy, in France, in ſuch prodigious flocks, as to prove a peſt to the inhabitants, eſpecially in the winter of the year 1740, when theſe birds deſtroyed all the corn near the ſea-coaſts, by tearing it up by the roots. A general war for this reaſon was declared againſt them, and carried on in earneſt, by knocking them on the head with clubs; but their numbers were ſo prodigious, that this availed but little: nor were the inhabitants relieved from this ſcourge till the north wind which had brought them ceaſed to blow, when they took leave. They eaſily become tame; and, being fatted, are thought to be a delicate food. They breed pretty far north, returning ſouthward in autumn. They fly in the ſhape of a wedge, like the wild geeſe, with great clamour. They are called in Shetland, *Horra geeſe,* from being found in that ſound. They are common alſo in America: breeding in the iſlands, and along the coaſt, and feed about high-water mark. Their food conſiſts of plants, ſuch as the ſmall biſtort, and black-berried heath, ſea-worms, berries, and the like. They are apt to have a fiſhy taſte, but in general are thought good food. The ſame fable has been told of this bird as of the bernacle, in reſpect to its being bred from trees. Called at Hudſon's-Bay, *Wetha may pa wew.*

16. The canadenſis is brown; its head and neck are black, and the throat is white. It meaſures three and an half feet in length. It is fonnd during the ſummer in Hudſon's-Bay, and parts beyond; alſo in Greenland; and, in the ſummer months, in various parts of North-America, as far as Carolina. Numbers breed at Hudſon's-Bay, and lay ſix or ſeven eggs; but the major part retire ſtill farther north. Their firſt appearance in the Bay is from about the middle of April to about the middle of May, when the inhabitants wait for them with impatience, being one of the chief articles for food, and many years kill 3000 or 4000, which are ſalted and barrelled. Their arrival is the harbinger of ſpring, and the month is named by the Indians the *gooſe-moon.* The Britiſh ſend out their ſervants, as well as Indians, to ſhoot theſe birds on their paſſage. It is in vain to purſue them; they therefore form a row of huts made of boughs, at muſket-ſhot diſtance from each other, and place them in a line acroſs the vaſt marſhes of the country. Each hovel, or, as they are called, *ſtand,* is occupied only by a ſingle perſon. Theſe attend the flight of the birds, and on their approach mimic their cackle ſo well, that the geeſe will anſwer, and wheel, and come nearer the ſtand. The ſportſman keeps motionleſs, and on his knees, with his gun cocked, the whole time; and never fires till he has ſeen the eyes of the geeſe. He fires as they are going from him, then picks up another gun that lies by him, and diſcharges that. The geeſe which he has killed he ſets upon ſticks as if alive, to decoy others; he alſo makes artificial birds for the ſame purpoſe. In a good day (for they fly in very uncertain and unequal numbers) a ſingle Indian will kill 200. Notwithſtanding every ſpecies of gooſe has a different call, yet the Indians are admirable in their imitation of every one. In this ſport, however, they muſt be very careful to ſecrete themſelves; for the birds are very ſhy and on the leaſt motion fly off directly. On their return ſouth, which is from the middle of Auguſt to the middle of October, much havoc is made among them; but theſe are preſerved freſh for winter ſtore, by putting them, feathers and all, into a large hole dug in the ground, and covering them with mould; and theſe, during the whole time of the froſt's laſting, are found perfectly ſweet and good. The Indians at Hudſon's-Bay call them *Apiſtiſkiſh.* This ſpecies is now pretty common, in a tame ſtate, both on the continent and in England; on the great canal of Verſailles hundreds are ſeen mixing with the ſwans with the greateſt cordiality; and the ſame at Chantilly. In England, likewiſe, they are thought a great ornament to the pieces of water

in many gentlemens ſeats where they are very familiar, and breed freely. The fleſh of the young birds is accounted good; and the feathers equal to thoſe of other geeſe, in ſo much as to prove an article of commerce much in the favour of thoſe places where they are in ſufficient numbers.

17. The molliſſima, or eider-duck, is double the ſize of the common duck, has a cylindrical bill, and the wax is divided behind, and wrinkled. The feathers, which are very ſoft and valuable, fall off during incubation. The male is white above, but black below and behind: the female is greeniſh. This ſpecies is found in the Weſtern Iſles of Scotland, particularly on Oranſa, Barra, Rona, and Heiſker, and on the Farn Iſles; but in greater numbers in Norway, Iceland and Greenland; from whence a vaſt quantity of the down, known by the name of *eider* or *edder*, which theſe birds furniſh, is annually exported. Its remarkably light, elaſtic, and warm qualities, make it highly eſteemed as a ſtuffing for coverlets, by ſuch whom age or infirmities render unable to ſupport the weight of common blankets. This down is produced from the breaſt of the birds in the breeding ſeaſon. It lays its eggs among the ſtones or plants near the ſhore; and prepares a ſoft bed for them, by plucking the down from its own breaſt: the natives watch the opportunity, and take away both eggs and neſt: the duck lays again, and repeats the plucking of its breaſt: if ſhe is robbed after that, ſhe will ſtill lay; but the drakes muſt ſupply the down, as her ſtock is now exhauſted: but if her eggs are taken a third time, ſhe wholly deſerts the place. See Down.

Theſe birds are not numerous on the iſles; and it is obſerved that the drakes keep on thoſe moſt remote from the ſitting places. The ducks continue on their neſts till you come almoſt cloſe to them; and when they riſe, are very ſlow fliers. The number of eggs in each neſt are from three to five, warmly bedded in the down; of a pale olive colour; and very large, gloſſy, and ſmooth. They now and then, however, lay ſo many as eight; for Van Troil informs us that no leſs than 16 have been found in one neſt, with two females, who agree remarkably well together.—In America, this bird is found as far ſouth as New-York, and breeds on the deſert iſles of New-England; but moſt common every where to the north. They are ſaid to be conſtant to the ſame breeding places, and that a pair has been obſerved to occupy the ſame neſt for 20 years together. They take their young on their backs inſtantly to ſea; then dive, to ſhake them off and teach them to ſhift for themſelves. It is ſaid, that the males are five years old before they come to their full colour; that they live to a great age, and will at length grow quite grey. Their food is ſhells, for which they dive to great depths. They are very numerous in the Eſquimaux lands, where, and in Greenland, they are called *mettek*. The natives kill them on the water with darts, ſtriking them the moment they appear after diving; and know the place from their being preceded by the riſing of bubbles. The fleſh is ſaid to be much valued.

18. The maula, or ſcaup-duck, is leſs than the common duck. The bill is broad, flat, and of a greyiſh blue colour; the head and neck are black, gloſſed with green; the breaſt is black; the back, the coverts of the wings, and the ſcapulars, are finely marked with numerous narrow tranſverſe bars of black and grey; the legs are duſky. Mr Willoughby acquaints us, that theſe birds take their name from feeding on ſcaup, or broken ſhell-fiſh; they differ infinitely in colours, ſo that in a flock of 40 or 50 there are not two alike.

19. The moſchata, or Muſcovy duck of Ray, has a naked papillous face, and is a native of India.—It is bigger than the wild duck, being in length two feet. This ſpecies is pretty common in a domeſticated ſtate in almoſt every nation; and the breed ought to be encouraged, as there is more fleſh on it than on the common duck, and of a very high flavour. The eggs are rounder than thoſe of a duck, and in young birds frequently incline to green. They lay more eggs, and ſit oftener, than other ducks. In an unconfined ſtate, they make the neſt on the ſtumps of old trees, and perch during the heat of the day on the branches of ſuch as are well clothed with leaves. When kept tame, they are ſufficiently docile; and the male will not unfrequently aſſociate and produce a mongrel breed with the common ducks. The name of Muſcovy duck was given to them from their exhaling a muſky odour, which proceeds from the gland placed on the rump in common with other birds.

20. The clypeata, or ſhovelar of Ray, has the end of its bill broad, rounded, and furniſhed with a ſmall hook. It is in length 21 inches; the female a trifle ſmaller. Both ſexes are apt to vary much in colour: the male likewiſe differs from the female inwardly, having juſt above the devarication of the windpipe where it paſſes into the lungs, an enlargement, or, as it is called by ſome, a *labyrinth*.—The chief food of this bird is inſects, for which it is continually muddling in the water with its bill. It is alſo ſaid dextrouſly to catch flies which paſs in its way over the water. Shrimps, among other things, have been found in its ſtomach on diſſection. This ſpecies is alſo found in moſt parts of Germany; throughout the Ruſſian dominions, as far as Kamtſchatka; and in North-America, in New-York and Carolina, during the winter ſeaſon. It is accounted pretty good food.

21. The ſtrepera, or gad-wall, has the wings variegated with black, white, and red. It inhabits England in the winter months, and is alſo found at the ſame ſeaſon in various parts of France and Italy. It migrates as far as Sweden, as ſummer advances, in order to breed; and found throughout Ruſſia and Siberia, except in the eaſtern part of the laſt, and Kamtſchatka. Being a very quick diver, it is difficult to be ſhot. It feeds morning and evening only, being hid among the reeds and ruſhes during the day. The noiſe it makes is not unlike that of a mallard, but louder. The fleſh is good.

22. The clangula, or golden eye of Ray, is variegated with black and white, and the head is interſperſed with blackiſh green feathers: it has a white ſpot near the mouth; and the eyes are of a ſhining gold colour. It is not unfrequent on the ſea-coaſts in winter, and appears in ſmall flocks; but paſſes to the north in ſpring in order to breed. It inhabits Sweden and Norway during the ſummer. It is an excellent diver, and feeds on ſmall ſhells. It is moſtly ſeen in the water, as it is very awkward in walking. It has been attempted to be domeſticated, but ſeems out of its element on land. With difficulty it can be brought to

eat any thing but bread; and the feet ſoon grow injured, inſomuch as at laſt to hinder it from walking. The fleſh is much eſteemed, and the birds are often ſeen in the market at the proper ſeaſon. This ſpecies is found in America; in winter as low as New-York; in ſummer, at Hudſon's Bay, where it frequents the freſh-water lakes, and makes in hollow trees a round neſt of graſs lined with feathers from its breaſt; lays from ſeven to ten white eggs.

23. The merſa, or Ural duck of Pallas, is ſomewhat bigger than the common teal. The bill is large, broad, very tumid above the noſtrils, and bifid in the adult bird, the end marked with diverging ſtriæ; colour blue: the head, and part of the neck, are white; on the crown is a large patch of black: the middle of the neck is black: the fore-parts of the body are a yellowiſh brown, undulated with black: the back is clouded with a cinereous and pale yellow, powdered with brown: the wings are ſmall; the tail longiſh, wedge-ſhaped, and black: the legs are brown, on the fore-part bluiſh, and placed as far back as in the diver genus. This ſpecies is not unfrequent in the greater lakes of the Ural mountains, and the rivers Ob and Irtiſch. It is not ſeen on the ground, for from the ſituation of its legs it is unable to walk; but it ſwims very well and quick: at which time the tail is immerſed in the water as far as the rump, ſerving by way of rudder, contrary to the common method of a duck's ſwimming. The neſt is formed of reeds, and floats, ſomething like to that of the grebe.

24. The American wigeon (*le canard jenſen* of Buffon), is rather bigger than the European wigeon. The bill is of a lead colour: the crown and forehead of a yellowiſh white: the hind-part of the neck and head is black and white, ſpeckled; and behind the eye is a black mark, changing in ſome lights to green: the back and ſcapulars are of a pale ruſt-colour, waved with tranſverſe black lines; in the middle of the wing coverts there is a large bed of white: the quills and tail are deep brown: the legs duſky. It inhabits North-America, from Carolina to Hudſon's Bay; but is no where a common bird. It is called at New-York the *Pheaſant Duck*. It is more plenty at St Domingo and Cayenne, where it is called *vingeon* or *gingeon*. At Martinico great flocks of them often take ſhort flights from one rice plantation to another, where they make much havoc, particularly during the rainy ſeaſon. They are ſaid to perch on trees. They feed in company and have a centinel on the watch like ſome other birds. They are ſeldom ſeen during the day, lying hid in places ſhaded from the ſun: but ſo ſoon as that luminary diſappears, they come forth from their hiding-places to feed; and, during this, make a particular kind of noiſe, by which the ſportſman is directed in his ſearch after them: at other times their note is a kind of ſoft whiſtle, which is often imitated in order to decoy them within reach of the gun. They ſit in January; and in March the young are ſeen running about. They lay many eggs. Sometimes theſe are hatched under hens; in which caſe they are, while young, familiar, though when grown up exceedingly quarrelſome with other ducks: their fleſh is moſt excellent, eſpecially ſuch as are brought up tame. They appear upon the coaſt of Hudſon's Bay in May, as ſoon as the thaws come on, chiefly in pairs: they lay there only from ſix to eight eggs; and feed on flies and worms in the ſwamps. They depart in flocks in autumn. They are known by the name of *atheikima aſheep*.

25. The acuta, pin-tail, or ſea-pheaſant of Ray, has a long acuminated tail, black below, with a white line on each ſide of the back part of the head. It is a native of Europe. Mr Hartlib, in the appendix to his *Legacy*, tells us, that theſe birds are found in great abundance in Connaught in Ireland, in the month of February only; and that they are much eſteemed for their delicacy.

26. The glacialis, or long-tailed duck, is inferior in ſize to the former. The bill is ſhort, black at the tip and baſe, orange-coloured in the middle; the cheeks are of a pale brown; the hind part of the head, and the neck both before and behind, are white; the breaſt and back are of a deep chocolate colour; the four middle feathers of the tail are black, and two of them near four inches longer than the others, which are white; the legs duſky. Theſe birds breed in the moſt northern parts of the world; and only viſit our coaſts in the ſevereſt winters. It breeds in Hudſon's Bay and Greenland, among the ſtones and graſs, making its neſt, like the eider, with the down of its own breaſt, which is equal in value to that of the eider, if it could be got in equal quantity; but the ſpecies is ſcarcer. It lays five eggs; ſwims and dives admirably; and feeds on ſhell-fiſh, which it gets in very deep water. It flies irregularly, ſometimes ſhowing its back, ſometimes its belly. It continues in Greenland the whole year, in unfrozen places; but there are ſeaſons ſo very ſevere, as at times to force them towards the ſouth. Thoſe which breed between Lapland and the polar circle, are often driven into Sweden and the neighbourhood of Peterſburgh: thoſe from the coaſt of the Icy ſea, as low as lat. 55; but on the ſetting in of froſt, they retire ſtill further ſouth, unleſs where ſome open ſpots remain in the rivers. They viſit the freſh-water lakes in the Orkneys, in October, and continue there till April. At ſun-ſet they are ſeen, in great flocks, returning to and from the bays, where they frequently paſs the night, and make ſuch a noiſe as to be heard ſome miles in froſty weather.

27. The ferina, pochard, or red-headed wigeon of Ray, has a lead-coloured bill: the head and neck are of a bright gay colour: the breaſt and part of the back where it joins the neck are black: the coverts of the wings, the ſcapulars, back, and ſides under the wings, are of a pale grey, elegantly marked with narrow lines of black: the tail conſiſts of twelve ſhort feathers of a deep grey colour: the legs are lead-coloured; and the irides of a bright yellow, tinged with red. The head of the female is of a pale reddiſh brown. In England, theſe birds frequent the fens in the winter ſeaſon, and are carried to the London markets ſometimes in conſiderable numbers, where they are known by the name of *Dun Birds*, and are eſteemed excellent eating. In winter, they paſs pretty far to the ſouth, being found in Egypt, about Cairo. They come into France the end of October in ſmall flocks, from 20 to 40; and are found in Carolina in winter. They feed on ſmall fiſh and ſhells. Their flight is rapid and ſtrong; but the flocks form no particular ſhape in flying.

28. The querquedula, garganey, or firſt teal of Aldrovandus, has a green ſpot on the wings, and a white

line above the eyes. It frequents the freſh waters of Europe. In many places it is called the *ſummer-teal*.

29. The crecca, or common teal, has a green ſpot on the wings, and a white line both above and below the eyes. It is of a ſmall ſize, only 14 inches in length. The teal is frequent in the London markets along with the wild-duck. It is met with in Duddingſton-loch, a freſh-water lake, within a mile of Edinburgh. In France it ſtays throughout the year, and makes a neſt in April among the ruſhes, on the edges of ponds; it is compoſed of the tendereſt ſtalks of them, with the addition of the pith, and a quantity of feathers. The neſt is of a large ſize, and placed in the water, ſo as to riſe and fall with it. The eggs are the ſize of thoſe of a pigeon, of a dirty white, marked with ſmall hazel ſpots. It is ſaid to feed on the graſs and weeds which grow on the edges of the ponds which it frequents, as well as the ſeeds of the ruſhes; it will alſo eat ſmall fiſh. The fleſh is accounted excellent. It is found to the north as high as Iceland; and is mentioned as inhabiting the Caſpian ſea to the ſouth.

30. The hiſtrionica, or duſky ſpotted duck of Edwards, is of a brown colour, variegated with white and blue; it has a double line on the ears and temples; the collar is white, and there is a white ſtreak on the neck. It inhabits from Carolina to Greenland: in the laſt it frequents, during ſummer, the rapid rivers, and the moſt ſhady parts; neſtling on the banks, among the low ſhrubs. It ſwims and dives admirably. In winter it ſeeks the open ſea, flies high and ſwiftly, and is very clamorous. It feeds on ſhell-fiſh, ſpawn, and the larvæ of gnats. Is found in Iceland, and as low as Sondmor. It is common from the lake Baikal to Kamtſchatka; and breeds there, as well as every where elſe, about the moſt rocky and rapid torrents.

31. The minuta, or little white and brown duck of Edwards, is of a greyiſh colour, with white ears, and the prime feathers of the wings blackiſh. This and the former, according to Latham, are found both on the Old and New continents. On the firſt, it is ſeen as far ſouth as the lake Baikal, and from thence to Kamtſchatka, particularly up the river Ochotſka; alſo in Iceland, and as low as Sondmor. In America, it is found from Carolina to Newfoundland, and Hudſon's Bay; alſo in Greenland, where it frequents, during ſummer, bays and rivers, eſpecially near their mouths, and is a very noiſy ſpecies. It is fond of ſhady places, and makes its neſt on the ſhore among the ſhrubs. Its food is ſmall ſhells, eggs of fiſhes, and particularly the larvæ of gnats. It ſwims well, even in the moſt rapid ſtreams; and dives to admiration: it likewiſe flies ſwift, and to a great height: from which circumſtances, it is not eaſily taken. Late navigators met with it at Aoonalaſhka. It is pretty frequent in the ſmall rivulets of Hudſon's Bay, about 90 miles inland; ſeldom in large rivers. It lays 10 or more white eggs, like thoſe of the pigeon, on the graſs; and the young brood ſpeckled in a very pretty manner. It migrates ſouth in autumn.

32. The boſchas, common wild-duck of Ray, or mallard; the intermediate tail-feathers of the drake are turned backward, and the bill is ſtrait. It frequents the lakes of different countries, and feeds upon frogs and ſeveral ſorts of inſects.—The wild-ducks pair in the ſpring: build their neſts among ruſhes near the water, and lay from 10 to 16 eggs. The female is a very artful bird; and does not always make the neſt cloſe to the water, but frequently at a good diſtance from it; in which caſe the duck will take the young in its beak or between its legs. It is known ſometimes to lay the eggs in a high tree, in a deſerted magpie's or crow's neſt. At moulting-time, when they cannot fly, they are caught in great numbers. They abound greatly in Lincolnſhire, the great magazine of wild-fowl in Great Britain; where prodigious numbers are taken annually in the Decoys. Birds with flat bills, that find their food by groping, have three pair of nerves that extend to the end of their bills: theſe nerves are remarkably conſpicuous in the head and bill of the wild-duck, and are larger than thoſe of a gooſe or any other bird yet known: this is the reaſon they grope for food more than any other bird whatever.—The common tame ſpecies of ducks take their origin from theſe, and may be traced to it by unerring characters. The drakes, howſoever they vary in colours, always retain the curled feathers of the tail, and both ſexes the form of the bill, of the wild kind. Nature ſports in the colours of all domeſtic animals; and for a wiſe and uſeful end, That mankind may the more readily diſtinguiſh and claim their reſpective property.

In France this ſpecies is not often ſeen, except in winter; appearing in October, and going north in ſpring. They are caught in various manners; among the reſt, in decoys, as in England; the chief place for which is Picardy, where prodigious numbers are taken, particularly on the river Somme. It is alſo cuſtomary there to wait for the flocks paſſing over certain known places, and the ſportſman, having a wicker cage, containing a quantity of tame birds, lets out one at a time, at a convenient ſeaſon, which enticing the paſſengers within gunſhot, five or ſix are often killed at once by an expert markſman. They are now and then taken alſo by a hook baited with a bit of ſheep's lights, which ſwimming on the water, the bird ſwallows the bait, and with it the hook. Various other means of catching ducks and geeſe are peculiar to certain nations; of which one ſeems worth mentioning from its ſingularity:—The perſon wiſhing to take theſe, wades into the water up to the chin, and having his head covered with an empty calabaſh, approaches the place where the ducks are; when they, not regarding an object of this ſort, ſuffer the man freely to mix with the flock; after which he has only to pull them by the legs under the water, one after another, till he is ſatisfied; returning as unſuſpected by the remainder as when he firſt came among them. This method is frequently put into practice on the river Ganges, uſing the earthen veſſels of the Gentoos inſtead of the calabaſhes: theſe veſſels are what the Gentoos boil their rice in, and are called Kutcharee pots (they likewiſe make a diſh for their tables in them, which goes by the ſame name): after theſe are once uſed they look upon them as defiled, and in courſe throw them into the river as uſeleſs; and the duck-takers find them convenient for their purpoſe, as the ducks, from conſtantly ſeeing the veſſels float down the ſtream, look upon them as objects of full as little regard as a calabaſh. The above, or ſome ſuch method, is alſo practiſed in China as well as in India. The Chineſe, however, though they make great uſe of ducks, do not prefer the wild ſort, being in general extremely fond of tame ones: and it is ſaid that the major part of theſe are hatched by artificial heat; the eggs, being laid in boxes of ſand, are placed on a brick hearth, to which is given a proper heat during the time required for hatching. The ducklings are fed with little craw-fiſhes and crabs, boiled and cut ſmall, and afterwards mixed with boiled rice; and in about a fortnight ſhift for themſelves, when the Chineſe provide them an old ſtepmother, who leads them where they are to find provender for themſelves; being firſt put on board a ſampane or boat, which is deſtined for their habitation, and from which the whole flock, often to the amount of 300 or 400, go out to feed, and return at command. This method is uſed nine months out of the twelve (for in the colder months, it does not ſucceed; and is ſo far from a novelty, that it may be every where ſeen; but more eſpecially about the time of cutting the rice and gleaning the crop, when the maſters of the duck ſampanes row up and down the river according to the opportunity of procuring food, which is found in plenty, at the tide of ebb, on the rice plantations, as they are overflowed at high water. It is curious to ſee how the ducks obey their maſter; for ſome thouſands, belonging to different boats, will feed at large on the ſame ſpot, and on a ſignal given will follow their leader to their reſpective ſampanes, without a ſtranger being found among them*. This is ſtill more extraordinary, if we conſider the number of inhabited ſampanes on the Tigris, ſuppoſed to be no leſs than 40,000, which are moored in rows cloſe to each other, with a narrow paſſage at intervals for boats to paſs up and down the river. The Tigris, at Canton, is ſomewhat wider than the Thames at London, and the whole river is there covered in this manner for the extent of at leaſt a mile. See *Cook's laſt voyage*, iii. 443.

33. The galericulata, or Chineſe teal of Edwards, has a hanging creſt; and on the hinder part of the back, on both ſides, there is a crooked, flat, elevated feather; the creſt is green and red; and the back is brown, and ſpotted with blue; the erect feathers on the back are red and blunt; one edge of the inmoſt wing-feather, when the wings are ſhut, is raiſed over the back, and is red, and like a ſickle before. This moſt ſingular and elegant ſpecies is a native of China and Japan, where it is kept by the inhabitants for the ſake of its beauty. It is not near ſo common in China as many other kinds, or perhaps they are politically held dear to the European purchaſers; they are frequently expoſed to ſale at Canton in cages, and the common price is from ſix to ten dollars per pair: they are not unfrequently carried to England alive; but require care, as they ſeem more tender than our ſpecies. Attempts have been made to breed them in England, but without ſucceſs, though they are familiar enough. The bird is known in Japan by the name of *Kimnodſui*. The Engliſh in China give it the name of *mandarin duck*.

34. The ſponſa, or ſummer-duck of Cateſby, is a moſt elegant ſpecies. It has a depending green creſt, variegated with blue and white; the back is likewiſe variegated with blue and white; the breaſt is grey, and ſpotted with white; and the throat is white. It inhabits Mexico, and ſome of the Weſt India iſles, migrating in the ſummer ſeaſon as far north as 40 degrees, or a little beyond. It appears at New-York early in the ſpring, and breeds there; making its neſt in the decayed hollows of trees, or ſuch as have been made by woodpeckers, and often between the forks of the branches; and when the young are hatched, the mother takes them on her back to the water. The fleſh is much eſteemed. This is the ſpecies, the neck of which the natives of Louiſiana uſe to ornament their pipes or calumets of peace with; and at the laſt-named place it is found throughout the year.

35. The aborea, or black-billed whiſtling duck of Edwards, is of a reddiſh brown colour, with a ſort of creſt on the head; the belly is ſpotted with black and white. It is a native of America. Sloane informs us, that this duck perches on trees; that it is about 20 inches long from the end of the bill to the point of the tail; and that it makes a kind of whiſtling noiſe, from which circumſtance it has received its name.

36. The fuligula, or tufted duck of Ray, has a hanging creſt, a black body, and the wings and belly ſpotted with white. This ſpecies is found in Europe as far as Norway. In the winter months it is not unfrequent in England; being met with in the markets in that ſeaſon, and is much eſteemed. It is common alſo throughout the Ruſſian empire, going northward to breed. Is frequent in Kamtſchatka. The male diſappears during the incubation of the female.

There are 62 other ſpecies enumerated by ornithologiſts; the whole number hitherto deſcribed being 98.

ANASARCA, a ſpecies of dropſy. See MEDICINE.

ANASSUS, or ANAXUS (anc. geog.), a river in the territory of Venice, (Pliny); now the *Piave*, which riſing from the mountains of Tyrol, not far from the borders of Carinthia, runs from north to ſouth, through the territories of Cadorina, Belluno, Feltre, and, after running from weſt to eaſt, through Trevigi, falls into the Adriatic, 13 miles to the ſouth-eaſt of Venice.

ANASTASIS, a term among ancient phyſicians, for a riſing up to go to ſtool. It alſo ſignifies the paſſage of any humour, when expelled from one part, and obliged to remove to another.

ANASTASIUS I. emperor of the eaſt, ſucceeded Zeno in the year 491, and was inaugurated that ſame year on April the 11th. The Manicheans and Arians were greatly in hopes of being ſupported by the new emperor; the former becauſe his mother was their friend, and favoured their ſect; the latter becauſe the emperor's uncle was of their opinion: but if Anaſtaſius did not perſecute them (as we do not find he ever did), yet it does not appear that he ſupported either of theſe ſects. But in order to maintain the peace of the church, upon which the tranquillity of the ſtate very much depended, he declared, that ſuch biſhops or other clergymen who ſhould diſturb the public tranquillity, by maintaining with too much heat either ſide of the queſtion for or againſt the council of Chalcedon, ſhould be deprived of their benefices. Accordingly the diſputes concerning Eutychianiſm running to a very great height, and Euphemius being deeply concerned

* *Oſbec & Toreen's Voyage*, i. 194. ii. 255.

cerned in them, the emperor expelled him from his ſee, and choſe Macedonius in his ſtead. The hatred which the different parties entertained againſt one another occaſioned often ſuch tumults and ſeditions at Conſtantinople, as threatened the life of the emperor himſelf; who, to keep the people in awe, ordered that the governor of the city ſhould be preſent at all church-aſſemblies and public proceſſions. This was ſo much the more neceſſary, becauſe theſe tumults were chiefly occaſioned by a kind of doxology or ſhort hymn which uſed to be ſung at divine ſervice. This doxology conſiſted only of the following words, αγιος ο Θεος, αγιος ισχυρος, αγιος αθανατος, that is, "Holy God, holy the powerful, holy the immortal;" for which reaſon it was called τρισαγιος, *Triſagius*, "three times holy;" becauſe the word *holy* was therein three times repeated. The orthodox uſed to ſing that hymn without any addition, or by adding only to it, αγια τριας, ελεησον ημας, i. e. "Holy Trinity, have mercy upon us:" But Peter the Fuller, biſhop of Antioch, pretended to add theſe words to it, viz. ο ϛαυρωθεις δι ημας, i. e. "who haſt been crucified for us;" and as it was ſuppoſed that the firſt holy related to the Father, the ſecond to the Son, the third to the Holy Ghoſt, and adding theſe words, *who haſt been crucified for us*, ſeemed to inſinuate that the whole conſubſtantial Trinity had ſuffered; for which reaſon the orthodox were reſolved not to admit this addition. Anaſtaſius deſiring to have thoſe fatal words added to that hymn whenever it ſhould be ſung at Conſtantinople, this occaſioned a terrible ſedition in the city, as though the very fundamentals of Chriſtianity had been overthrown. Macedonius and his clergy are ſaid to have raiſed that ſedition, which came to ſuch a height that the emperor himſelf was obliged to come, without his crown on his head, and in a very humble manner, to the Circus, where he declared to the people that he was very willing to quit the imperial throne; but he told them at the ſame time, that they could not all enjoy the ſovereign power, which does not admit of a partnerſhip; and that one perſon ſtill muſt govern them if he reſigned the crown. This diſcourſe had ſuch a power over the raging multitude, that, as if they had been divinely inſpired, they immediately requeſted the emperor to take up his crown, promiſing that they would be quiet and obedient for the future. Anaſtaſius is by the Popiſh writers repreſented as a great perſecutor of the orthodox, becauſe he baniſhed and deprived Euphemius and Macedonius; but they ſhould prove that theſe two prelates had been unjuſtly baniſhed, which is a very hard taſk. As to the civil government, it is confeſſed that at the beginning of his reign he ſhowed himſelf a very good prince; he eaſed the people of a very heavy tax called *Chryſargyrum*, under which they had groaned for a long time; he prohibited the fighting with wild beaſts; he raiſed ſeveral buildings; he avoided being involved in dangerous wars as much as lay in his power. Anaſtaſius reigned 27 years three months and three days, or, according to F. Pagi, wanting three days; and died July the 10th, A. C. 518, in the 88th year of his age.

Anastasius, ſurnamed *Bibliothecarius*, a Roman abbot, library-keeper of the Vatican, and one of the moſt learned men of the ninth century, aſſiſted in 869 at the fourth general council, the acts and canons of which he tranſlated from the Greek into Latin. He alſo compoſed the lives of ſeveral popes, and other works; the beſt edition of which is that of the Vatican.

ANASTATICA, the rose of Jericho: A genus of the ſiliculoſa order, belonging to the tetradynamia claſs of plants; and, in the natural method, ranking under the 39th order, *Siliquoſæ*. The characters are: The *calyx* is a perianthium conſiſting of four leaves, and perſiſtent: The *corolla* conſiſts of four cruciform petals: The *ſtamina* conſiſt of ſix ſubulated filaments the length of the calyx; the antheræ are roundiſh: The *piſtillum* has a ſmall bifid germen; the ſtylus mucronated and oblique; the ſtigma headed: The *pericarpium* is a ſhort bilocular ſilicle, retuſe, and crowned on the margin with valvulæ twice as long as the partition: The *ſeeds* are ſolitary and roundiſh.—Of this genus there are two

Species. 1. The ſyriaca, a native of Syria, is not cultivated or known in Britain. 2. The hierochuntica is a native of the ſandy parts of Paleſtine and the Red Sea. It is a low annual plant, dividing into many irregular woody branches near the root. At each joint is placed a ſingle, oblong, hairy leaf; and at the ſame places come out ſmall ſingle flowers, of a whitiſh green colour, compoſed of four leaves placed in the form of a croſs. Theſe are ſucceeded by ſhort wrinkled pods, having four ſmall horns; theſe open into four cells, in each of which is lodged a ſingle brown ſeed.—When the ſeeds of this plant are ripe, the branches will draw up and contract; ſo that the whole plant forms a kind of ball or globular body, which will expand on laying it a ſhort time in warm water. This property it retains for many years, on which account it is preſerved as a curioſity by ſome people. From this property the monks have given it the name of *Roſa Mariæ*, pretending that the flowers open on the night on which our Saviour was born.

Culture. This plant is propagated by ſeeds, which ſhould be ſown in the beginning of March, in a moderate hot-bed in pots, in which the plants are deſigned to remain. When they come up, the plants ſhould be thinned, leaving them about ſix inches aſunder, and obſerving to keep them clear of weeds, which is all the care they require. If the ſeaſon proves favourable, they will flower in Auguſt; but unleſs the autumn proves warm and dry, they will not perfect their ſeeds in Britain.

ANASTOMOSIS, in anatomy, the opening of the mouths of veſſels, in order to diſcharge their contained fluids. It is likewiſe uſed for the communication of two veſſels at their extremities; as the inoſculation of a vein with a vein, of an artery with an artery, or of an artery with a vein.

ANASTOMATICS, medicines ſuppoſed to have the power of opening the mouths of the veſſels, and promoting the circulation; ſuch as deobſtruent, cathartic, and ſudorific medicines.

ANASTROPHE, in rhetoric and grammar, denotes the inverſion of the natural order of the words: ſuch is, *ſaxa per et ſcopulos*, for *per ſaxa et ſcopulos*.

ANASUS, or Anisus (anc. geog.) now the *Ens*, a river of Germany; which, riſing on the borders of the territory of Saltzburg, then ſeparating Upper Stiria from Upper Auſtria, and waſhing the town of Ens, falls, at the diſtance of a mile below it, into the Danube, in a courſe from ſouth to north.

ANATHEMA, among eccleſiaſtical writers, imports whatever is ſet apart, ſeparated, or divided; but is moſt uſually meant to expreſs the cutting off a perſon from the privileges of ſociety and communion with the faithful.

The anathema differs from excommunication in the circumſtances of being attended with curſes and execrations. It was practiſed in the primitive church againſt notorious offenders; and the form of that pronounced by Synecius againſt one Andronicus, is as follows: "Let no church of God be open to Andronicus, but let every ſanctuary be ſhut againſt him. I admoniſh both private men and magiſtrates, to receive him neither under their roof nor to their table; and prieſts more eſpecially, that they neither converſe with him living, nor attend his funeral when dead."

Several councils alſo have pronounced anathemas againſt ſuch as they thought corrupted the purity of the faith; and their deciſions have been conceived in the following form: *Si quis dixeret, &c. anathema ſit.*

There are two kinds of anathemas, the one judiciary, and the other abjuratory. The former can only be denounced by a council, a pope, or a biſhop; the latter makes a part of the ceremony of abjuration, the convert being obliged to anathematize the hereſy he abjures.

ANATHEMA, in heathen antiquity, was an offering or preſent made to ſome deity, and hung up in the temple. Whenever a perſon left off his employment, it was uſual to dedicate the tools to the patron-deity of the trade. Perſons, too, who had eſcaped from imminent danger, as ſhipwreck and the like, or had met with any other remarkable inſtance of good fortune, ſeldom failed to teſtify their gratitude by ſome preſent of this kind.

ANATHOTH, a hamlet of Paleſtine, very near Jeruſalem (Joſephus), about three miles and a half to the north; the ruins of which are ſtill to be ſeen. It was the birth-place of the prophet Jeremiah, and one of the Levitical towns in the tribe of Benjamin.

ANATIFERA CONCHA, the trivial name of a ſpecies of the lepas, a teſtaceous animal. See LEPAS.

ANATOCISM, ANATOCISMUS, an uſurious contract, wherein the intereſts ariſing from the principal ſum are added to the principal itſelf, and intereſt exacted upon the whole. The word is originally Greek, but uſed by Cicero in Latin; whence it has deſcended into moſt other languages. It comes from the propoſition ανα, which in compoſition ſignifies *repetition* or *duplication*, and τοκος, *uſury*. Anatociſm is what we properly call *intereſt upon intereſt*, or *compound intereſt*. This is the worſt kind of uſury, and has been ſeverely condemned by the Roman law, as well as by the common laws of moſt other countries. See INTEREST.

ANATOLIA. See NATOLIA.

ANATOMY,

THE art of diſſecting, or artificially ſeparating and taking to pieces, the different parts of the human body, in order to an exact diſcovery of their ſituation, ſtructure, and œconomy.—The word is Greek, ανατομη; derived from ανατεμνω, to diſſect, or ſeparate by cutting.

INTRODUCTION.

§ 1. *Hiſtory of Anatomy.*

THIS art ſeems to have been very ancient; though, for a long time, known only in an imperfect manner.—The firſt men who lived muſt have ſoon acquired ſome notions of the ſtructure of their own bodies, particularly of the external parts, and of ſome even of the internal, ſuch as bones, joints, and ſinews, which are expoſed to the examination of the ſenſes in living bodies.

This rude knowledge muſt have been gradually improved, by the accidents to which the body is expoſed, by the neceſſities of life, and by the various cuſtoms, ceremonies, and ſuperſtitions, of different nations. Thus, the obſervance of bodies killed by violence, attention to wounded men, and to many diſeaſes, the various ways of putting criminals to death, the funeral ceremonies, and a variety of ſuch things, muſt have ſhown men every day more and more of themſelves; eſpecially as curioſity and ſelf-love would here urge them powerfully to obſervation and reflection.

The brute-creation having ſuch an affinity to man in outward form, motions, ſenſes, and ways of life; the generation of the ſpecies, and the effect of death upon the body, being obſerved to be ſo nearly the ſame in both; the concluſion was not only obvious, but unavoidable, that their bodies were formed nearly upon the ſame model. And the opportunities of examining the bodies of brutes were ſo eaſily procured, indeed ſo neceſſarily occurred in the common buſineſs of life, that the huntſman in making uſe of his prey, the prieſt in ſacrificing, the augur in divination, and, above all, the butcher, or thoſe who might out of curioſity attend upon his operations, muſt have been daily adding to the little ſtock of anatomical knowledge. Accordingly we find, in fact, that the South-ſea-iſlanders, who have been left to their own obſervation and reaſoning, without the aſſiſtance of letters, have yet a conſiderable ſhare of rude or wild anatomical and phyſiological knowledge. Dr Hunter informs us, that when Omai was in his muſeum with Mr Banks, though he could not explain himſelf intelligibly, they plainly ſaw that he knew the principal parts of the body, and ſomething likewiſe of their uſes; and manifeſted a great curioſity or deſire of having the functions of the internal parts of the body explained to him; particularly the relative functions of the two ſexes, which with him ſeemed to be the moſt intereſting object of the human mind.

We may further imagine, that the philoſophers of the moſt early ages, that is, the men of curioſity, obſervation, experience and reflection, could not overlook an inſtance of natural organization, which was ſo intereſting, and at the ſame time ſo wonderful, more eſpecially ſuch of them as applied to the ſtudy and cure of diſeaſes. We know that phyſic was a branch of philoſophy till the age of Hippocrates.

Thus the art muſt have been circumſtanced in its beginning. We ſhall next ſee from the teſtimony of hiſtorians and other writers, how it actually appeared as an art, from the time that writing was introduced among men; how it was improved and conveyed down to us through a long ſeries of ages.

Civilization, and improvements of every kind, would naturally begin in fertile countries and healthful climates, where there would be leiſure for reflection, and an appetite for amuſement. Accordingly, writing, and many other uſeful and ornamental inventions and arts, appear to have been cultivated in the eaſtern parts of Aſia long before the earlieſt times that are treated of by the Greek or other European writers; and that the arts and learning of thoſe eaſtern people were in ſubſequent times gradually communicated to adjacent countries, eſpecially by the medium of traffic. The cuſtoms, ſuperſtitions, and climate of eaſtern countries, however, appear to have been as unfavourable to practical anatomy, as they were inviting to the ſtudy of aſtronomy, geometry, poetry, and all the ſofter arts of peace.

Animal bodies there, run ſo quickly into nauſeous putrefaction, that the early inhabitants muſt have avoided ſuch offenſive employments, as anatomical inquiries, like their poſterity at this day. And, in fact, it does not appear, by the writings of the Grecians, or Jews, or Phœnicians, or of other eaſtern countries, that anatomy was particularly cultivated by any of thoſe eaſtern nations. In tracing it backwards to its infancy, we cannot go farther into antiquity than the times of the Grecian philoſophers. As an art in the ſtate of ſome cultivation, it may be ſaid to have been brought forth and bred up among them as a branch of natural knowledge.

The æra of philoſophy, as it was called, began with Thales the Mileſian being declared by a very general conſent of the people, the moſt wiſe of all the Grecians, 480 years before Chriſt. The philoſophers of his ſchool, which was called the Ionian, cultivated principally natural knowledge. Socrates, the ſeventh in ſucceſſion of their great teachers, introduced the ſtudy of morals, and was thence ſaid to bring down philoſophy from heaven, to make men truly wiſe and happy.

In the writings of his ſcholar and ſucceſſor Plato, we ſee that the philoſophers had carefully conſidered the human body, both in its organization and functions; and though they had not arrived at the knowledge of the more minute and intricate parts, which required the ſucceſſive labour and attention of many ages, they had made up very noble and comprehenſive ideas of the ſubject in general. The anatomical deſcriptions of Xenophon and Plato have had the honour of being quoted by Longinus (§ xxxii.) as ſpecimens of ſublime writing: and the extract from Plato is ſtill more remarkable for its containing the rudiments of the circulation of the blood. "The heart (ſays Plato) is the centre or knot of the blood-veſſels; the ſpring or fountain of the blood which is carried impetuouſly round; the blood is the *pabulum* or food of the fleſh; and, for the purpoſe of nouriſhment, the body is laid out into canals, like thoſe which are drawn through gardens, that the blood may be conveyed, as from a fountain, to every part of the pervious body."

Hippocrates was nearly contemporary with the great philoſophers of whom we have been ſpeaking, about 400 years before the Chriſtian æra. He is ſaid to have ſeparated the profeſſion of philoſophy and phyſic, and to have been the firſt who applied to phyſic alone as the buſineſs of his life. He is likewiſe generally ſuppoſed to be the firſt who wrote upon anatomy. We know of nothing that was written expreſsly upon the ſubject before; and the firſt anatomical diſſection which has been recorded, was made by his friend Democritus of Abdera.

If, however, we read the works of Hippocrates with impartiality, and apply his accounts of the parts to what we now know of the human body, we muſt allow his deſcriptions to be imperfect, incorrect, ſometimes extravagant, and often unintelligible, that of the bones only excepted. He ſeems to have ſtudied theſe with more ſucceſs than the other parts, and tells us that he had an opportunity of ſeeing an human ſkeleton.

From Hippocrates to Galen, who flouriſhed towards the end of the ſecond century, in the decline of the Roman empire, that is, in the ſpace of 600 years, anatomy was greatly improved; the philoſophers ſtill conſidering it as a moſt curious and intereſting branch of natural knowledge, and the phyſicians, as a principal foundation of their art. Both of them, in that interval of time, contributed daily to the common ſtock, by more accurate and extended obſervations, and by the lights of improving philoſophy.

As theſe two great men had applied very particularly to the ſtudy of animal bodies, they not only made great improvements, eſpecially in phyſiology, but raiſed the credit of natural knowledge, and ſpread it as wide as Alexander's empire.

Few of Ariſtotle's writings were made public in his lifetime. He affected to ſay that they would be unintelligible to thoſe who had not heard them explained at his lectures: and, except the uſe which Theophraſtus made of them, they were loſt to the public for above 130 years after the death of Theophraſtus; and at laſt came out defective from bad preſervation, and corrupted by men, who, without proper qualifications, preſumed to correct and ſupply what was loſt.

From the time of Theophraſtus, the ſtudy of natural knowledge at Athens was forever on the decline; and the reputation of the Lycæum and Academy was almoſt confined to the ſtudies which are ſubſervient to oratory and public ſpeaking.

The other great inſtitution for Grecian education, was at Alexandria in Egypt. The firſt Ptolemies, both from their love of literature, and to give true and permanent dignity to their empire, and to Alexander's favourite city, ſet up a grand ſchool in the palace itſelf, with a muſeum and library, which, we may ſay, has been the moſt famed in the world. Anatomy, among other ſciences, was publicly taught; and the two diſtinguiſhed anatomiſts were Eraſiſtratus the pupil and friend of Theophraſtus, and Herophilus. Their voluminous works are all loſt; but they are quoted by Galen almoſt in every page. Theſe profeſſors were probably the firſt who were authorized to diſſect human bodies; a peculiarity which marks ſtrongly the philoſophical magnanimity of the firſt Ptolemy, and fixes a great æra in the hiſtory of anatomy. And it was, no doubt, from this particular advantage which the Alexandrians had above all others, that their ſchool not only gained, but for many centuries preſerved, the firſt reputation for medical education. Ammianus Marcellinus, who lived about 650 years after the ſchools were ſet up, ſays, they were ſo famous in his time, that it was enough to ſecure credit to any phyſician, if he could ſay he had ſtudied at Alexandria.

Herophilus has been ſaid to have anatomized 700 bodies. We muſt allow for exaggeration. Nay, it was ſaid, that both he and Eraſiſtratus made it a common practice to open living bodies, that they might diſcover the more ſecret ſprings of life. But this, no doubt, was only a vulgar opinion, riſing from the prejudices of mankind; and accordingly, without any good reaſon, ſuch tales have been told of modern anatomiſts, and have been believed by the vulgar.

Among the Romans, though it is probable they had phyſicians and ſurgeons from the foundation of the city, yet we have no account of any of theſe applying themſelves to anatomy for a very long time. Archagathus was the firſt Greek phyſician eſtabliſhed in Rome, and he was baniſhed the city on account of the ſeverity of his operations.—Aſclepiades, who flouriſhed in Rome 101 years after Archagathus, in the time of Pompey, attained ſuch a high reputation as to be ranked in the ſame claſs with Hippocrates. He ſeemed to have ſome notion of the air in reſpiration acting by its weight; and in accounting for digeſtion, he ſuppoſed the food to be no farther changed than by a comminution into extremely ſmall parts, which being diſtributed to the ſeveral parts of the body, is aſſimilated to the nature of each. One Caſſius, commonly thought to be a diſciple of Aſclepiades, accounted for the right ſide of the body becoming paralytic on hurting the left ſide of the brain, in the ſame manner as has been done by the moderns, viz. by the croſſing of the nerves from the right to the left ſide of the brain.

From the time of Aſclepiades to the ſecond century, phyſicians ſeem to have been greatly encouraged at Rome; and, in the writings of Celſus, Rufus, Pliny, Cœlius, Aurelianus, and Aræteus, we find ſeveral anatomical obſervations, but moſtly very ſuperficial and inaccurate. Towards the end of the ſecond century lived Claudius Gallenus Pergamus, whoſe name is ſo well known in the medical world. He applied himſelf particularly to the ſtudy of anatomy, and did more in that way than all that went before him. He ſeems, however, to have been at a great loſs for human ſubjects to operate upon; and therefore his deſcription of the parts are moſtly taken from brute animals. His works contain the fulleſt hiſtory of anatomiſts, and the moſt complete ſyſtem of the ſcience, to be met with any where before him, or for ſeveral centuries after; ſo that a number of paſſages in them were reckoned abſolutely unintelligible for many ages, until explained by the diſcoveries of ſucceeding anatomiſts.

About the end of the fourth century, Nimeſius biſhop of Emiſſa wrote a treatiſe on the nature of man, in which it is ſaid were contained two celebrated modern diſcoveries; the one, the uſes of the bile, boaſted of by Sylvius de la Boe; and the other, the circulation of the blood. This laſt, however, is proved by Dr Friend, in his Hiſtory of phyſic, p. 229. to be falſely aſcribed to this author.

The Roman empire beginning now to be oppreſſed by the barbarians, and ſunk in groſs ſuperſtition, learning of all kinds decreaſed; and when the empire was totally overwhelmed by thoſe barbarous nations, every appearance of ſcience was almoſt extinguiſhed in Europe. The only remains of it were among the Arabians in Spain and in Aſia.—The Saracens who came into Spain, deſtroyed at firſt all the Greek books which the Vandals had ſpared: but though their government was in a conſtant ſtruggle and fluctuation during 800 years before they were driven out, they received a taſte for learning from their countrymen of the eaſt; ſeveral of their princes encouraged liberal ſtudies; public ſchools were ſet up at Cordova, Toledo, and other towns, and tranſlations of the Greeks into the Arabic were univerſally in the hands of their teachers.

Thus was the learning of the Grecians transferred to the Arabians. But though they had ſo good a foundation to build upon, this art was never improved while they were maſters of the world: for they were ſatiſfied with commenting upon Galen; and ſeem to have made no diſſections of human bodies.

Abdollaliph, who was himſelf a teacher of anatomy, a man eminent in his time (at and before 1203) for his learning and curioſity; a great traveller, who had been bred at Bagdad, and had ſeen many of the great cities and principal places for ſtudy in the Saracen empire; who had a favourable opinion of original obſervation, in oppoſition to book-learning; who boldly corrected ſome of Galen's errors, and was perſuaded that many more might be detected; this man, we ſay, never made or ſaw, or ſeemed to think of a human diſſection. He diſcovered Galen's errors in the oſteology, by going to burying-grounds, with his ſtudents and others, where he examined and demonſtrated the bones; he earneſtly recommended that method of ſtudy, in preference even to the reading of Galen, and thought that many farther improvements might be made; yet he ſeemed not to have an idea that a freſh ſubject might be diſſected with that view.

Perhaps the Jewiſh tenets, which the Mahometans adopted, about uncleanlineſs and pollution, might prevent their handling dead bodies; or their opinion of what was ſuppoſed to paſs between an angel and the dead perſon, might make them think diſturbing the dead highly ſacrilegious. Such, however, as Arabian learning was, for many ages together there was hardly any other in all the weſtern countries of Europe. It was introduced by the eſtabliſhment of the Saracens in Spain in 711, and kept its ground till the reſtoration of learning in the end of the 15th century. The ſtate of anatomy in Europe, in the times of Arabian influence, may be ſeen by reading a very ſhort ſyſtem of anatomy drawn up by Mundinus, in the year 1315. It was extracted principally from what the Arabians had preſerved of Galen's doctrine; and, rude as it is, in that age, it was judged to be ſo maſterly a performance, that it was ordered by a public decree, that it ſhould be read in all the ſchools of Italy; and it actually continued to be almoſt the only book which was read upon the ſubject for above 200 years. Corteſius gives him the credit of being the great reſtorer of anatomy, and the firſt who diſſected human bodies among the moderns.

A general prejudice againſt diſſection, however, prevailed till the 16th century. The emperor Charles V. ordered a conſultation to be held by the divines of Salamanca, in order to determine whether or not it was lawful in point of conſcience to diſſect a dead body. In Muſcovy, till very lately, both anatomy and the uſe of ſkeletons were forbidden, the firſt as inhuman, and the latter as ſubſervient to witchcraft.

In the beginning of the 15th century, learning revived conſiderably in Europe, and particularly phyſic, by means of copies of the Greek authors brought from the ſack of Conſtantinople; after which the number of anatomiſts and anatomical books increaſed to a prodigious degree.—The Europeans becoming thus poſſeſſed of the antient Greek fathers of medicine, were for a long time ſo much occupied in correcting the copies they could obtain, ſtudying the meaning, and commenting upon them, that they attempted nothing of their own, eſpecially in anatomy.

And here the late Dr Hunter introduces into the annals of this art, a genius of the firſt rate, Leonardo da Vinci, who had been formerly overlooked, becauſe he was of another profeſſion, and becauſe he publiſhed nothing upon the ſubject. He is conſidered by the Doctor as by far the beſt anatomiſt and phyſiologiſt of his time; and was certainly the firſt man we know of who introduced the practice of making anatomical drawings.

Vaſſare, in his lives of the painters, ſpeaks of Leonardo thus, after telling us that he had compoſed a book of the anatomy of a horſe, for his own ſtudy: "He afterwards applied himſelf with more diligence to the human anatomy; in which ſtudy he reciprocally received and communicated aſſiſtance to Marc. Antonio della Torre, an excellent philoſopher, who then read lectures in Pavia, and wrote upon this ſubject; and who was the firſt, as I have heard, who began to illuſtrate medicine from the doctrine of Galen, and to give true light to anatomy, which till that time had been involved in clouds of darkneſs and ignorance. In this he availed himſelf exceedingly of the genius and labour of Leonardo, who made a book of ſtudies, drawn with red chalk, and touched with a pen, with great diligence, of ſuch ſubjects as he had himſelf diſſected; where he made all the bones, and to thoſe he joined, in their order, all the nerves, and covered them with the muſcles. And concerning thoſe, from part to part, he wrote remarks in letters of an ugly form, which are written by the left hand, backwards, and not to be underſtood but by thoſe who know the method of reading them; for they are not to be read without a looking-glaſs. Of theſe papers of the human anatomy, there is a great part in the poſſeſſion of M. Franceſco da Melzo, a Milaneſe gentleman, who, in the time of Leonardo, was a moſt beautiful boy, and much beloved by him, as he is now a beautiful and genteel old man, who reads thoſe writings, and carefully preſerves them, as precious relicts, together with the portrait of Leonardo, of happy memory. It appears impoſſible that that divine ſpirit ſhould reaſon ſo well upon the arteries, and muſcles, and nerves, and veins; and with ſuch diligence of every thing, &c. &c."

Thoſe very drawings and the writings are happily found to be preſerved in his Britannic Majeſty's great collection of original drawings, where the Doctor was permitted to examine them; and his ſentiments upon the occaſion he thus expreſſes: "I expected to ſee little more than ſuch deſigns in anatomy, as might be uſeful to a painter in his own profeſſion; but I ſaw, and indeed with aſtoniſhment, that Leonardo had been a general and a deep ſtudent. When I conſider what pains he has taken upon every part of the body, the ſuperiority of his univerſal genius, his particular excellence in mechanics and hydraulics, and the attention with which ſuch a man would examine and ſee objects which he was to draw, I am fully perſuaded that Leonardo was the beſt anatomiſt at that time in the world. We muſt give the 15th century the credit of Leonardo's anatomical ſtudies, as he was 55 years of age at the cloſe of that century."

In the beginning of the 16th century, Achillinus and Benedictus, but particularly Berengarius and Maſſa, followed out the improvement of anatomy in Italy, where they taught it, and publiſhed upon the ſubject. Theſe firſt improvers made ſome diſcoveries from their own diſſections: but it is not ſurpriſing that they ſhould have been diffident of themſelves, and have followed Galen almoſt blindly, when his authority had been ſo long eſtabliſhed, and when the enthuſiaſm for Greek authors was riſing to ſuch a pitch.

Soon after this, we may ſay about the year 1540, the great Veſalius appeared. He was ſtudious, laborious, and ambitious. From Bruſſels, the place of his birth, he went to Louvain, and thence to Paris, where anatomy was not yet making a conſiderable figure, and then to Louvain to teach; from which place, very fortunately for his reputation, he was called to Italy, where he met with every opportunity that ſuch a genius for anatomy could deſire, that is, books, ſubjects, and excellent draughtſmen. He was equally laborious in reading the ancients, and in diſſecting bodies. And in making the compariſon, he could not but ſee, that there was great room for improvement, and that many of Galen's deſcriptions were erroneous. When he was but a young man, he publiſhed a noble ſyſtem of anatomy, illuſtrated with a great number of elegant figures.—In this work he found ſo many occaſions of correcting Galen, that his contemporaries, partial to antiquity, and jealous of his reputation, complained that he carried his turn for improvement and criticiſms to licentiouſneſs. The ſpirit of oppoſition and emulation was preſently rouſed; and Sylvius in France, Columbus, Fallopius, and Euſtachius in Italy, who were all in high anatomical reputation about the middle of this 16th century, endeavoured to defend Galen at the expence of Veſalius. In their diſputes they made their appeals to the human body: and thus in a few years the art was greatly improved. And Veſalius being detected in the very fault which he condemned in Galen, to wit, deſcribing from the diſſections of brutes, and not of the human body, it expoſed ſo fully that blunder of the older anatomiſts, that in ſucceeding times there has been little reaſon for ſuch complaint.—Beſides the above, he publiſhed ſeveral other anatomical treatiſes. He has been particularly ſerviceable by impoſing

poſing names on the muſcles, moſt of which are retained to this day. Formerly they were diſtinguiſhed by numbers, which were differently applied by almoſt every author.

In 1561, Gabriel Fallopius, profeſſor of anatomy at Padua, publiſhed a treatiſe of anatomy under the title of *Obſervationes Anatomicæ*. This was deſigned as a ſupplement to Veſalius; many of whoſe deſcriptions he corrects, though he always makes mention of him in an honourable manner. Fallopius made many great diſcoveries, and his book is well worth the peruſal of every anatomiſt.

In 1563, Bartholomæus Euſtachius publiſhed his *Opuſcula Anatomica* at Venice, which have ever ſince been juſtly admired for the exactneſs of the deſcriptions, and the diſcoveries contained in them. He publiſhed afterwards ſome other pieces, in which there is little of anatomy; but never publiſhed the great work he had promiſed, which was to be adorned with copperplates repreſenting all the parts of the human body. Theſe plates, after lying buried in an old cabinet for upwards of 150 years, were at laſt diſcovered and publiſhed in the year 1714, by Lanciſi the pope's phyſician; who added a ſhort explicatory text, becauſe Euſtachius's own writing could not be found.

From this time the ſtudy of anatomy gradually diffuſed itſelf over Europe; inſomuch that for the laſt hundred years it has been daily improving by the labour of a number of profeſſed anatomiſts almoſt in every country of Europe.

We may form a judgment about the ſtate of anatomy even in Italy, in the beginning of the 17th century, from the information of Corteſius. He had been profeſſor of anatomy at Bologna, and was then profeſſor of medicine at Maſſana; where, though he had a great deſire to improve himſelf in the art, and to finiſh a treatiſe which he had begun on practical anatomy, in 24 years he could twice only procure an opportunity of diſſecting a human body, and then it was with difficulties and in hurry; whereas he had expected to have done ſo, he ſays, *once every year, according to the cuſtom in the famous academies of Italy.*

In the very end of the 16th century, the great Harvey, as was the cuſtom of the times, went to Italy to ſtudy medicine; for Italy was ſtill the favourite ſeat of the arts: And in the very beginning of the 17th century, ſoon after Harvey's return to England, his maſter in anatomy, Fabricius ab Aquapendente, publiſhed an account of the valves in the veins, which he had diſcovered many years before, and no doubt taught in his lectures when Harvey attended him.

This diſcovery evidently affected the eſtabliſhed doctrine of all ages, that the veins carried the blood from the liver to all parts of the body for nouriſhment. It ſet Harvey to work upon the uſe of the heart and vaſcular ſyſtems in animals; and in the courſe of ſome years he was ſo happy as to diſcover, and to prove beyond all poſſibility of doubt, the *circulation of the blood.* He taught his new doctrine in his lectures about the year 1616, and printed it in 1628.

It was by far the moſt important ſtep that had been made in the knowledge of animal bodies in any age. It not only reflected uſeful lights upon what had been already found out in anatomy, but alſo pointed out the means of further inveſtigation. And accordingly we ſee, that from Harvey to the preſent time, anatomy has been ſo much improved, that we may reaſonably queſtion if the ancients have been further outdone by the moderns in any other branch of knowledge. From one day to another there has been a conſtant ſucceſſion of diſcoveries, relating either to the ſtructure or functions of our body; and new anatomical proceſſes, both of inveſtigation and demonſtration, have been daily invented. Many parts of the body, which were not known in Harvey's time, have ſince then been brought to light: and of thoſe which were known, the internal compoſition and functions remained unexplained; and indeed muſt have remained unexplicable without the knowledge of the circulation.

Harvey's doctrine at firſt met with conſiderable oppoſition; but in the ſpace of about 20 years it was ſo generally and ſo warmly embraced, that it was imagined every thing in phyſic would be explained. But time and experience have taught us, that we ſtill are, and probably muſt long continue to be, very ignorant; and that in the ſtudy of the human body, and of its diſeaſes, there will always be an extenſive field for the exerciſe of ſagacity.

After the diſcovery and knowledge of the circulation of the blood, the next queſtion would naturally have been about the paſſage and route of the nutritious part of the food or chyle from the bowels to the blood-veſſels: And, by good fortune, in a few years after Harvey had made his diſcovery, Aſellius, an Italian phyſician, found out the lacteals, or veſſels which carry the chyle from the inteſtines; and printed his account of them, with coloured prints, in the year 1627, the very year before Harvey's book came out.

For a number of years after theſe two publications, the anatomiſts in all parts of Europe were daily opening living dogs, either to ſee the lacteals or to obſerve the phenomena of the circulation. In making an experiment of this kind, Pecquet in France was fortunate enough to diſcover the thoracic duct, or common trunk of all the lacteals, which conveys the chyle into the ſubclavian vein. He printed his diſcovery in the year 1651. And now the lacteals having been traced from the inteſtines to the thoracic duct, and that duct having been traced to its termination in a blood-veſſel, the paſſage of the chyle was completely made out.

The ſame practice of opening living animals furniſhed occaſions of diſcovering the lymphatic veſſels. This good fortune fell to the lot of Rudbec firſt, a young Swediſh anatomiſt; and then to Thomas Bartholine, a Daniſh anatomiſt, who was the firſt who appeared in print upon the lymphatics. His book came out in the year 1653, that is two years after that of Pecquet. And then it was very evident that they had been ſeen before by Dr Higmore and others, who had miſtaken them for lacteals. But none of the anatomiſts of thoſe times could make out the origin of the lymphatics, and none of the phyſiologiſts could give a ſatisfactory account of their uſe.

The circulation of the blood and the paſſage of the chyle having been ſatisfactorily traced out in full-grown animals, the anatomiſts were naturally led next to conſider how theſe animal proceſſes were carried on in the child while in the womb of the mother. Accordingly the male and female organs, the appearances and contents of the pregnant uterus, the incubated egg, and every phenomenon which could illuſtrate generation, became the favourite ſubject, for about 30 years, with the principal anatomiſts of Europe.

Thus it would appear to have been in theory: but Dr Hunter believes, that in fact, as Harvey's maſter Fabricius laid the foundation for the diſcovery of the circulation of the blood by teaching him the valves of the veins, and thereby inviting him to conſider that ſubject; ſo Fabricius by his lectures, and by his elegant work *De formato fœtu, et de formatione ovi et pulli*, probably made that likewiſe a favourite ſubject with Dr Harvey. But whether he took up the ſubject of generation in conſequence of his diſcovery of the circulation, or was led to it by his honoured maſter Fabricius, he ſpent a great deal of his time in the inquiry; and publiſhed his obſervations in a book *De generatione animalium*, in the year 1651, that is ſix years before his death.

In a few years after this, Swammerdam, Van Horn, Steno, and De Graaf, excited great attention to the ſubject of generation, by their ſuppoſed diſcovery that the females of viviparous animals have ovaria, that is, cluſters of eggs in their loins, like oviparous animals; which, when impregnated by the male, are conveyed into the uterus: ſo that a child is produced from an egg as well as a chick; with this difference, that one is hatched within, and the other without, the body of the mother.

Malpighi, a great Italian genius, ſome time after, made conſiderable advances upon the ſubject of generation. He had the good fortune to be the firſt who uſed magnifying glaſſes with addreſs in tracing the firſt appearances in the formation of animals. He likewiſe made many other obſervations and improvements in the *minutiæ* of anatomy by his microſcopical labours, and by cultivating comparative anatomy.

This diſtinguiſhed anatomiſt gave the firſt public ſpecimen of his abilities, by printing a diſſertation on the lungs *anno* 1661; a period ſo remarkable for the ſtudy of nature, that it would be injuſtice to paſs it without particular notice.

At the ſame time flouriſhed Laurentius Bellinus at Florence, and was the firſt who introduced mathematical reaſoning in phyſic. In 1662, Simon Pauli publiſhed a treatiſe *De albandis oſſibus*. He had long been admired for the white ſkeletons he prepared; and at laſt diſcovered his method, which was by expoſing the bones all winter to the weather.

Johannes Swammerdam of Amſterdam alſo publiſhed ſome anatomical treatiſes; but was moſt remarkable for his knowledge of preſerving the parts of bodies entire for many years, by injecting their veſſels. He alſo publiſhed a treatiſe on reſpiration; wherein he mentioned his having figures of all the parts of the body as big as the life, cut in copper, which he deſigned to publiſh, with a complete ſyſtem of anatomy. Theſe, however, were never made public by Swammerdam; but, in 1683, Gothofridus Bidloo, profeſſor of anatomy at Leyden, publiſhed a work intitled *Anatomia corporis humani*, where all the parts were delineated in very large plates almoſt as big as the life. Mr Cowper, an Engliſh ſurgeon, bought 300 copies of theſe figures; and in 1698, publiſhed them with an Engliſh text, quite different from Bidloo's Latin one; to which were added letters in Bidloo's figures, and ſome few figures of Mr Cowper's own. To this work Cowper's name was prefixed, without the leaſt mention of Bidloo, except on purpoſe to confute him. Bidloo immediately publiſhed a very ill-natured pamphlet, called *Gulielmus Cowperus citatus coram tribunali*; appealing to the Royal Society, how far Cowper ought to be puniſhed as a plagiary of the worſt kind, and endeavouring to prove him an ignorant deceitful fellow. Cowper anſwered him in his own ſtyle, in a pamphlet called his *Vindiciæ*; endeavouring to prove, either that Bidloo did not underſtand his own tables, or that they were none of his. It was even alleged that thoſe were the tables promiſed by Swammerdam, and which Bidloo had got from his widow. This, however, appears to have been only an invidious ſurmiſe, there being unqueſtionable evidence that they were really the performance of Bidloo.

Soon after, Iſbrandus Diembroeck, profeſſor of anatomy at Utrecht, began to appear as an author. His work contained very little original; but he was at great pains to collect from others whatever was valuable in their writings, and his ſyſtem was the common ſtandard among anatomical ſtudents for many years.

About the ſame time, Antonius Liewenhoeck of Delft, improved conſiderably on Malpighi's uſe of microſcopes. Theſe two authors took up anatomy where others had dropt it; and, by this new art, they brought a number of amazing things to light. They diſcovered the red globules of the blood; they were enabled to ſee the actual circulation of the blood in the tranſparent parts of living animals, and could meaſure the velocity of its motion; they diſcovered that the arteries and veins had no intermediate cells or ſpungy ſubſtance, as Harvey and all the preceding anatomiſts had ſuppoſed, but communicated one with the other by a continuation of the ſame tube.

Liewenhoeck was in great fame likewiſe for his diſcovery of the animalcula in the ſemen. Indeed there was ſcarcely a part of the body, ſolid or fluid, which eſcaped his examination; and he almoſt every where found, that what appeared to the naked eye to be rude undigeſted matter, was in reality a beautiful and regular compound.

After this period, Nuck added to our knowledge of the abſorbent ſyſtem already mentioned, by his injections of the lymphatic glands; Ruyſch, by his deſcription of the valves of the lymphatic veſſels; and Dr Meckel, by his accurate account of the whole ſyſtem, and by tracing thoſe veſſels in many parts where they had not before been deſcribed.

Beſides theſe authors, Drs Hunter and Monro have called the attention of the public to this part of anatomy, in their controverſy concerning the diſcovery of the office of the lymphatics.

When the lymphatic veſſels were firſt ſeen and traced into the thoracic duct, it was natural for anatomiſts to ſuſpect, that as the lacteals abſorbed from the cavity of the inteſtines, the lymphatics, which are ſimilar in figure and ſtructure, might poſſibly do the ſame office with reſpect to other parts of the body: and accordingly, Dr Gliſſon, who wrote in 1654, ſuppoſes theſe veſſels aroſe from cavities, and that their uſe was to abſorb; and Frederic Hoffman has very explicitly laid down the doctrine of the lymphatic veſſels being a ſyſtem of abſorbents. But anatomiſts in general have been of a contrary opinion; for, from experiments [illegible] ticularly ſuch as were made by injections, they have been perſuaded that the lymphatic veſſels did not ariſe from cavities, and did not abſorb, but were merely continuations from ſmall arteries. The doctrine, therefore, that the lymphatics, like the lacteals, were abſorbents, as had been ſuggeſted by Gliſſon and by Hoffman, has been revived by Dr Hunter and Dr Monro, who have controverted the experiments of their predeceſſors in anatomy, and have endeavoured to prove that the lymphatic veſſels are not continued from arteries, but are abſorbents.

To this doctrine, however, ſeveral objections have been ſtarted, particularly by Haller (Elm. Phyſ. l. 24. § 2, 3.); and it has been found, that before the doctrine of the lymphatics being a ſyſtem of abſorbents can be eſtabliſhed, it muſt firſt be determined whether this ſyſtem is to be found in other animals beſides man and quadrupeds. Mr Hewſon claims the merit of having proved the affirmative of this queſtion, by diſcovering the lymphatic ſyſtem in birds, fiſh, and amphibious animals. See *Phil. Tranſ.* vol. lviii. and lxix.—And latterly, Mr Cruikſkank has traced the ramifications of that ſyſtem in almoſt every part of the body; and from his diſſections, figures have been made and lately publiſhed to the world. To Mr Sheldon alſo we are much indebted for his illuſtration of this ſyſtem, which promiſes to give great ſatisfaction, but of which only a part has yet been publiſhed.

The gravid uterus is a ſubject likewiſe which has received conſiderable improvements, particularly relating to one very important diſcovery; viz. that the internal membrane of the uterus, which Dr Hunter has named *decidua*, conſtitutes the exterior part of the ſecundines or after-birth, and ſeparates from the reſt of the uterus every time that a woman either bears a child or ſuffers a miſcarriage. This diſcovery includes another, to wit, that the placenta is partly made up of an excreſcence or effloreſcence from the uterus itſelf.

Theſe diſcoveries are of the utmoſt conſequence, both in the phyſiological queſtion about the connection between the mother and child, and likewiſe in explaining the phenomena of births and abortions, as well as in regulating obſtetrical practice.

The anatomiſts of this century have improved anatomy, and have made the ſtudy of it much more eaſy, by giving us more correct as well as more numerous figures. It is amazing to think of what has been done in that time. We have had four large folio books of figures of the bones, viz. Cheſelden's, Albinus's, Sue's and Trew's. Of the muſcles, we have had two large folios; one from Cowper, which is elegant; and one from Albinus, which, from the accuracy and labour of the work, we may ſuppoſe will never be outdone. Of the blood-veſſels we have a large folio from Dr Haller. We have had one upon the nerves from Dr. Meckel, and another by Dr Monro junior. We have had Albinus's, Roederer's, Jenty's, and Hunter's works upon the pregnant uterus; Weitbrecht and Leber on the joints and freſh bones; Soemerring on the brain; Zin on the eye; Cotunnius, Mekel junior, &c. on the ear; Walterus on the nerves of the thorax and abdomen; Dr Monro on the burſæ mucoſæ, &c.

It would be endleſs to mention the anatomical figures that have been publiſhed in this century, of particular and ſmaller parts of the body, by Morgagni, Ruyſch, Valſalva, Sanctorini, Heiſter, Vater, Cant, Zimmerman, Walterus, and others.

Thoſe elegant plates of the brain, however, juſt publiſhed by M. Vicq. d'Azyr, muſt not paſs without notice, eſpecially as they form part of an univerſal ſyſtem of anatomy and phyſiology, both human and comparative, propoſed to be executed in the ſame ſplendid ſtyle. Upon the brain alone 19 folio plates are employed; of which ſeveral are coloured. The figures are delineated with accuracy and clearneſs; but the colouring is rather beautiful than correct. Such parts of this work as may be publiſhed, cannot fail to be equally acceptable to the anatomiſt and the philoſopher; but the entire deſign is apparently too extenſive to be accompliſhed within the period of a ſingle life. In Great Britain, alſo, a very great anatomical work is carrying on by Andrew Bell, F. S. A. S. engraver to his Royal Highneſs the Prince of Wales, with the approbation of Dr Monro, and under the inſpection of his very ingenious aſſiſtant Mr Fyfe. It is to compoſe a complete illuſtration, both general and particular, of the human body, by a ſelection from the beſt plates of all the greateſt anatomiſts, as well foreign as Britiſh, exhibiting the lateſt diſcoveries in the ſcience, and accompanied with copious explanations. The whole number of plates mentioned in the Proſpectus is 240, of which 152 are already done; all in royal folio.

To the foreign treatiſes already mentioned may be added thoſe recently publiſhed by Sabbatier and Plenck on anatomy in general. In Great-Britain, the writings of Keil, Douglas, Cheſelden, the firſt Monro, Winſlow, &c. are too well known to need deſcription. The laſt of theſe uſed to be recommended as a ſtandard for the ſtudents of anatomy: but it has of late given place to a more accurate and comprehenſive ſyſtem, in three volumes, publiſhed by Mr Elliot of Edinburgh, upon a plan approved of by Dr Monro, and executed by Mr Fyfe. Dr Simmons of London has alſo obliged the world with an excellent ſyſtem of anatomy; and another work, under the title of “Elements of Anatomy and the Animal Oeconomy: in which the ſubjects are treated with uncommon elegance and perſpicuity.

In the latter part of the laſt century, anatomy made two great ſteps, by the invention of injections, and the method of making what we commonly call *preparations*. Theſe two modern arts have really been of infinite uſe to anatomy; and beſides have introduced an elegance into our adminiſtrations, which in former times could not have been ſuppoſed to be poſſible. They aroſe in Holland under Swammerdam and Ruyſch, and afterwards in England under Cowper, St. André, and others, where they have been greatly improved.

The anatomiſts of former ages had no other knowledge of the blood-veſſels, than what they were able to collect from laborious diſſections, and from examining the ſmaller branches of them, upon ſome lucky occaſion, when they were found more than commonly loaded with red blood. But filling the vaſcular ſyſtem with a bright coloured wax, enables us to trace the large veſſels with great eaſe, renders the ſmaller much more conſpicuous, and makes thouſands of the very minute ones viſible, which from their delicacy, and the tranſparency of their natural contents, are otherwiſe imperceptible.

The modern art of corroding the fleſhy parts with a menſtruum, and of leaving the moulded wax entire, is ſo exceedingly uſeful, and at the ſame time ſo ornamental, that it does great honour to the ingenious inventor Dr Nicholls.

The wax-work art of the moderns might deſerve notice in any hiſtory of anatomy, if the maſters in that way had not been ſo careleſs in their imitation. Many of the wax-figures are ſo tawdry with a ſhow of unnatural colours, and ſo very incorrect in the circumſtances of figure, ſituation, and the like, that though they ſtrike a vulgar eye with admiration, they muſt appear ridiculous to an anatomiſt. But thoſe figures which are caſt in wax, plaſter, or lead, from the real ſubject, and which of late years have been frequently made, are, of courſe, very correct in all the principal parts, and may be conſidered as no inſignificant acquiſition to modern anatomy. The proper, or principal uſe of this art is, to preſerve a very perfect likeneſs of ſuch ſubjects as we but ſeldom can meet with, or cannot well preſerve in a natural ſtate; a ſubject in pregnancy, for example.

The modern improved methods of preſerving animal bodies, or parts of them, has been of the greateſt ſervice to anatomy; eſpecially in ſaving the time and labour of the anatomiſt in the nicer diſſections of the ſmall parts of the body. For now, whatever he has prepared with care, he can preſerve; and the object is ready to be ſeen at any time. And in the ſame manner he can preſerve anatomical curioſities, or rarities of every kind; ſuch as, parts that are uncommonly formed; parts that are diſeaſed; the parts of the pregnant uterus and its contents. Large collections of ſuch curioſities, which modern anatomiſts are ſtriving almoſt every where to procure, are of infinite ſervice to the art, eſpecially in the hands of teachers. They give ſtudents clear ideas about many things which it is very eſſential to know, and yet which it is impoſſible that a teacher ſhould be able to ſhow otherwiſe, were he ever ſo well ſupplied with freſh ſubjects.

§ 2. *View of the Subject in general, and Plan of the following Treatiſe.*

THE etymology of the word *anatomy*, as above given, implies ſimply *diſſection*; but by this term ſomething more is uſually underſtood.

It is every day made uſe of to expreſs a knowledge of the human body; and a perſon who is ſaid to underſtand anatomy, is ſuppoſed to be converſant with the ſtructure and arrangement of the different ſolid parts of the body.

It is commonly divided into *Anatomy*, properly ſo called; and *Comparative* Anatomy: the firſt of theſe is confined ſolely to the human body; the latter includes all animals, ſo far as a knowledge of their ſtructure may tend to perfect our ideas of the human body. See COMPARATIVE *Anatomy*.

The term *anatomy* may alſo have another and more extenſive ſignification: it may be employed to expreſs not only a knowledge of the ſtructure and diſpoſition of the parts but likewiſe of their œconomy and uſe. Conſidered in this light, it will ſeldom fail to excite the curioſity of people of taſte, as a branch of philoſophy; ſince, if it is pleaſing to be acquainted with the ſtructure of the body, it is certainly more ſo to diſcover all the ſprings which give life and motion to the machine, and to obſerve the admirable mechaniſm by which ſo many different functions are executed.

Aſtronomy and anatomy, as Dr Hunter, after Fontenelle, obſerves, are the ſtudies which preſent us with the moſt ſtriking view of the two greateſt attributes of the Supreme Being. The firſt of theſe fills the mind with the idea of his immenſity, in the largeneſs, diſtances, and number of the heavenly bodies; the laſt, aſtoniſhes with his intelligence and art in the variety and delicacy of animal mechaniſm.

The human body has been commonly enough known by the name of *microcoſmus*, or the little world; as if it did not differ ſo much from the univerſal ſyſtem of nature in the ſymmetry and number of its parts as in their ſize.

Galen's excellent treatiſe *De uſu partium*, was compoſed as a proſe hymn to the Creator; and abounds with as irreſiſtible proofs of a ſupreme Cauſe and governing Providence, as we find in modern phyſico-theology. And Cicero dwells more on the ſtructure and œconomy of animals than on all the productions of nature beſides, when he wants to prove the exiſtence of the gods from the order and beauty of the univerſe. He there takes a ſurvey of the body of man in a moſt elegant ſynopſis of anatomy, and concludes thus: "Quibus rebus expoſitis, ſatis docuiſſe videor, hominis natura, quanto omnes anteiret animantes. Ex quo debet intelligi, nec figuram ſitumque membrorum, nec ingenii mentiſque vim talem effici potuiſſe fortuna."

The ſatisfaction of mind which ariſes from the ſtudy of anatomy, and the influence which it muſt naturally have upon our minds as philoſophers, cannot be better conveyed than by the following paſſage from the ſame author: "Quæ contuens animus, accepit ab his cognitionem deorem, ex qua oritur pietas: cui conjuncta juſtitia eſt, reliquæque virtutes: ex quibus vita beata exſiſtit, par et ſimiles deorum, nulla alia re niſi immortalitate, quæ nihil ad bene vivendum pertinet, cedens cœleſtibus."

It would be endleſs to quote the animated paſſages of this ſort which are to be found in the phyſicians, philoſophers, and theologiſts, who have conſidered the ſtructure and functions of animals with a view towards the Creator. It is a view which muſt ſtrike one with a moſt awful conviction. Who can know and conſider the thouſand evident proofs of the aſtoniſhing art of the Creator, in forming and ſuſtaining an animal body ſuch as ours, without feeling the moſt pleaſant enthuſiaſm? Can we ſeriouſly reflect upon this awful ſubject, without being almoſt loſt in adoration? without longing for another life after this, in which we may be gratified with the higheſt enjoyment, which our faculties and nature ſeem capable of, the ſeeing and comprehending the whole plan of the Creator, in forming the univerſe and in directing all its operations?

But the more immediate purpoſes of anatomy concern thoſe who are to be the guardians of health, as this ſtudy is neceſſary to lay a foundation for all the branches of medicine. The more we know of our fabric, the more reaſon we have to believe, that if our ſenſes were more acute, and our judgment more enlarged, we ſhould be able to trace many ſprings of life which are now hidden from us: by the ſame ſagacity we ſhould diſcover the true cauſes and nature of diſeaſes; and thereby be enabled to reſtore the health of many, who are now, from our more confined knowledge, ſaid to labour under incurable diſorders. By ſuch an intimate acquaintance with the œconomy of our bodies, we ſhould diſcover even the ſeeds of diſeaſes, and deſtroy them before they had taken root in the conſtitution.

That anatomy is the very baſis of ſurgery every body allows. It is diſſection alone that can teach us, where we may cut the living body with freedom and diſpatch; and where we may venture with great circumſpection and delicacy; and where we muſt not, upon any account, attempt it. This informs the *head*, gives dexterity to the *hand*, and familiarizes the *heart* with a ſort of neceſſary inhumanity, the uſe of cutting-inſtruments upon our fellow-creatures.

Beſides the knowledge of our body, through all the variety of its *ſtructure* and *operations* in a *ſound* ſtate, it is by anatomy only that we can arrive at the knowledge of the true nature of moſt of the diſeaſes which afflict humanity. The ſymptoms of many diſorders are often equivocal; and diſeaſes themſelves are thence frequently miſtaken, even by ſenſible, experienced, and attentive phyſicians. But by anatomical examination after death, we can with certainty find out the miſtake, and learn to avoid it in any ſimilar caſe.

This uſe of anatomy has been ſo generally adopted by the moderns, that the caſes already publiſhed are almoſt innumerable: Mangetus, Morgagni, indeed many of the beſt modern writings in phyſic, are full of them. And if we look among the phyſicians of the beſt character, and obſerve thoſe who have the *art* itſelf, rather than the *craft* of the profeſſion at heart; we ſhall find them conſtantly taking pains to procure leave to examine the bodies of their patients after death.

After having conſidered the riſe and progreſs of anatomy; the various diſcoveries that have been made in it, from time to time; the great number of diligent obſervers who have applied themſelves to this art; and the importance of the ſtudy, not only for the prevention and cure of diſeaſes, but in furniſhing the livelieſt proofs of divine wiſdom; the following queſtions ſeem naturally to ariſe: For what purpoſe is there ſuch a variety of parts in the human body? Why ſuch a complication of nice and tender machinery? Why was there not rather a more ſimple, leſs delicate, and leſs expenſive frame (A)?

In order to acquire a ſatisfactory general idea of this ſubject, and find a ſolution of all ſuch queſtions, let us, in our imaginations, *make* a man: in other words let us ſuppoſe that the *mind*, or immaterial part, is to be placed in a corporeal fabric, in order to hold a correſpondence with other material beings by the intervention of the body; and then conſider, *a priori*, what will be wanted for her accommodation. In this inquiry, we ſhall plainly ſee the neceſſity or advantage, and therefore the final cauſe, of moſt of the parts which we actually find in the human body. And if we conſider that, in order to anſwer ſome of the requiſites, human wit and invention would be very inſufficient; we need not be ſurpriſed if we meet with ſome parts of the body whoſe uſe we cannot yet perceive, and with ſome operations and functions which we cannot explain. We can ſee that the whole bears the moſt ſtriking characters of excelling wiſdom and ingenuity: but the imperfect ſenſes and capacity of *man* cannot pretend to reach every part of a machine, which nothing leſs than the intelligence and power of the *Supreme Being* could contrive and execute.

Firſt, then, the *mind*, the thinking, immaterial agent, muſt be provided with a place of immediate reſidence, which ſhall have all the requiſites for the union of ſpirit and body; accordingly ſhe is provided with the *brain*, where ſhe dwells as governor and ſuperintendant of the whole fabric.

In the next place, as ſhe is to hold a correſpondence with all the material beings around her, ſhe muſt be ſupplied with organs fitted to receive the different kinds of impreſſions which they will make. In fact, therefore, we ſee that ſhe is provided with the organs of ſenſe, as we call them: the eye is adapted to light; the ear to ſound; the noſe to ſmell; the mouth to taſte; and the ſkin to touch.

Further: She muſt be furniſhed with organs of communication between herſelf in the brain and thoſe organs of ſenſe, to give her information of all the impreſſions that are made upon them: and ſhe muſt have organs between herſelf in the brain and every other part of the body, fitted to convey her commands and influence over the whole. For theſe purpoſes the nerves are actually given. They are chords, which riſe from the brain, the immediate reſidence of the mind, and diſperſe themſelves in branches through all parts of the body. They convey all the different kinds of ſenſations to the mind, in the brain; and likewiſe carry out from thence all her commands or influence to the other parts of the body. They are intended to be occaſional monitors againſt all ſuch impreſſions as might endanger the well-being of the whole, or of any particular part; which vindicates the Creator of all things, in having actually ſubjected us to thoſe many diſagreeable and painful ſenſations which we are expoſed to from a thouſand accidents in life.

Moreover, the mind, in this corporeal ſyſtem, muſt be endued with the power of moving from place to place, that ſhe may have intercourſe with a variety of objects; that ſhe may fly from ſuch as are diſagreeable, dangerous or hurtful, and purſue ſuch as are pleaſant or uſeful to her. And accordingly ſhe is furniſhed with limbs, and with muſcles and tendons, the inſtruments of motion, which are found in every part of the fabric where motion is neceſſary.

But to ſupport, to give firmneſs and ſhape to the fabric; to keep the ſofter parts in their proper places; to give fixed points for, and the proper direction to its motions, as well as to protect ſome of the more important and tender organs from external injuries; there

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(A) The following beautiful repreſentation is taken from the late Dr Hunter's *Introductory Lecture in Anatomy*.

there muſt be ſome firm prop-work interwoven through the whole. And, in fact, for ſuch purpoſes the bones are given.

The prop-work muſt not be made into one rigid fabric, for that would prevent motion. Therefore there are a number of bones.

Theſe pieces muſt all be firmly bound together, to prevent their diſlocation. And this end is perfectly well anſwered by the ligaments.

The extremities of theſe bony pieces, where they move and rub upon one another, muſt have ſmooth and ſlippery ſurfaces for eaſy motion. This is moſt happily provided for, by the cartilages and mucus of the joints.

The interſtices of all thoſe parts muſt be filled up with ſome ſoft and ductile matter, which ſhall keep them in their places, unite them, and at the ſame time allow them to move a little upon one another. And theſe purpoſes are anſwered by the cellular membrane or adipoſe ſubſtance.

There muſt be an outward covering over the whole apparatus, both to give it compactneſs and to defend it from a thouſand injuries: which, in fact, are the very purpoſes of the ſkin and other integuments.

Laſtly, the mind being formed for ſociety and intercourſe with beings of her own kind, ſhe muſt be endued with powers of expreſſing and communicating her thoughts by ſome ſenſible marks or ſigns; which ſhall be both eaſy to herſelf, and admit of great variety; and accordingly ſhe is provided with the organs and faculty of ſpeech, by which ſhe can throw out ſigns with amazing facility, and vary them without end.

Thus we have built up an animal body which would ſeem to be pretty complete: but as it is the nature of matter to be altered and worked upon by matter; ſo in a very little time ſuch a living creature muſt be deſtroyed, if there is no proviſion for repairing the injuries which ſhe muſt commit upon herſelf, and thoſe which ſhe muſt be expoſed to from without. Therefore a treaſure of blood is actually provided in the heart and vaſcular ſyſtem, full of nutritious and healing particles, fluid enough to penetrate into the minuteſt parts of the animal; impelled by the heart, and conveyed by the arteries, it waſhes every part, builds up what was broken down, and ſweeps away the old and uſeleſs materials. Hence we ſee the neceſſity or advantage of the heart aud arterial ſyſtem.

What more there was of this blood than enough to repair the preſent damages of the machine, muſt not be loſt, but ſhould be returned again to the heart; and for this purpoſe the venous ſyſtem is actually provided. Theſe requiſites in the animal explain, *a priori*, the circulation of the blood.

The old materials which were become uſeleſs, and are ſwept off by the current of blood, muſt be ſeparated and thrown out of the ſyſtem. Therefore glands, the organs of Secretion, are given for ſtraining whatever is redundant, vapid, or noxious, from the maſs of blood; and when ſtrained, they are thrown out by emunctories, called organs of Excretion.

But now, as the machine muſt be conſtantly wearing, the reparation muſt be carried on without intermiſſion, and the ſtrainers muſt always be employed. Therefore there is actually a perpetual circulation of the blood, and the ſecretions are always going on.

Even all this proviſion, however, would not be ſufficient; for that ſtore of blood would ſoon be conſumed, and the fabric would break down, if there were not a proviſion made for freſh ſupplies. Theſe we obſerve, in fact, are profuſely ſcattered round her in the animal and vegetable kingdoms; and ſhe is furniſhed with hands, the fitteſt inſtruments that could have been contrived, for gathering them, and for preparing them in a variety of ways for the mouth.

But theſe ſupplies, which we call food, muſt be conſiderably changed; they muſt be converted into blood. Therefore ſhe is provided with teeth for cutting and bruiſing the food, and with a ſtomach for melting it down: In ſhort, with all the organs ſubſervient to digeſtion.—The finer parts of the aliments only can be uſeful in the conſtitution: theſe muſt be taken up and conveyed into the blood, and the dregs muſt be thrown off. With this view the inteſtinal canal is actually given. It ſeparates the nutritious part, which we call *chyle*, to be conveyed into the blood by the ſyſtem of abſorbent veſſels; and the fæces paſs downwards, to be conducted out of the body.

Now we have got our animal not only furniſhed with what is wanted for its immediate exiſtence, but alſo with the powers of protracting that exiſtence to an indefinite length of time. But its duration, we may preſume, muſt neceſſarily be limited: for as it is nouriſhed, grows, and is raiſed up to its full ſtrength and utmoſt perfection; ſo it muſt, in time, in common with all material beings, begin to decay, and then hurry on to final ruin. Hence we ſee the neceſſity of a ſcheme for renovation. Accordingly wiſe Providence, to perpetuate, as well as preſerve his work, beſides giving a ſtrong appetite for life and ſelf-preſervation, has made animals male and female, and given them ſuch organs and paſſions as will ſecure the propagation of the ſpecies to the end of time.

Thus we ſee, that by the very imperfect ſurvey which human reaſon is able to take of this ſubject, the animal man muſt neceſſarily be complex in his corporeal ſyſtem, and in its operations.

He muſt have one great and general ſyſtem, the vaſcular, branching through the whole for circulation: Another, the nervous, with its appendages the organs of ſenſe, for every kind of feeling: And a third, for the union and connection of all thoſe parts.

Beſides theſe primary and general ſyſtems, he requires others which may be more local or confined: One for ſtrength, ſupport, and protection; the bony compages: Another for the requiſite motions of the parts among themſelves, as well as for moving from place to place; the muſcular part of the body: Another to prepare nouriſhment for the daily recruit of the body; the digeſtive organs: And one for propagating the ſpecies; the organs of generation.

And in taking this general ſurvey of what would appear, *a priori*, to be neceſſary for adapting an animal to the ſituations of life, we obſerve, with great ſatisfaction, that man is accordingly made of ſuch ſyſtems, and for ſuch purpoſes. He has them all; and he has nothing more, except the organs of reſpiration. Breathing it ſeemed difficult to account for *a priori*: we only knew it to be in fact eſſentially neceſſary to life. Notwithſtanding this, when we ſaw all the other parts of the body, and their functions, ſo well accounted for, and ſo wiſely adapted to their ſeveral purpoſes, there could be no doubt that reſpiration was ſo likewiſe: And accordingly, the diſcoveries of Dr Prieſtley have lately thrown light upon this function alſo, as will be ſhown in its proper place.

Of all the different ſyſtems in the human body, the uſe and neceſſity are not more apparent, than the wiſdom and contrivance which has been exerted in putting them all into the moſt compact and convenient form: in diſpoſing them ſo, that they ſhall mutually receive, and give helps to one another; and that all, or many of the parts, ſhall not only anſwer their principal end or purpoſe, but operate ſucceſsfully and uſefully in a variety of ſecondary ways.

If we conſider the whole animal machine in this light, and compare it with any machine in which human art has exerted its utmoſt; ſuppoſe the beſt conſtructed ſhip that ever was built, we ſhall be convinced beyond the poſſibility of doubt, that there are intelligence and power far ſurpaſſing what humanity can boaſt of.

One ſuperiority in the natural machine is peculiarly ſtriking.—In machines of human contrivance or art, there is no internal power, no principle in the machine itſelf, by which it can alter and accommodate itſelf to any injury which it may ſuffer, or make up any injury which admits of repair. But in the natural machine, the animal body, this is moſt wonderfully provided for, by internal powers in the machine itſelf; many of which are not more certain and obvious in their effects, than they are above all human comprehenſion as to the manner and means of their operation. Thus, a wound heals up of itſelf; a broken bone is made firm again by a callus; a dead part is ſeparated and thrown off; noxious juices are driven out by ſome of the emunctories; a redundancy is removed by ſome ſpontaneous bleeding; a bleeding naturally ſtops of itſelf; and a great loſs of blood, from any cauſe, is in ſome meaſure compenſated, by a contracting power in the vaſcular ſyſtem, which accommodates the capacity of the veſſels to the quantity contained. The ſtomach gives information when the ſupplies have been expended; repreſents, with great exactneſs, the quantity and the quality of what is wanted in the preſent ſtate of the machine; and in proportion as ſhe meets with neglect, riſes in her demand, urges her petition in a louder tone, and with more forcible arguments. For its protection, an animal body reſiſts heat and cold in a very wonderful manner, and preſerves an equal temperature in a burning and in a freezing atmoſphere.

A farther excellence or ſuperiority in the natural machine, if poſſible, ſtill more aſtoniſhing, more beyond all human comprehenſion, than what we have been ſpeaking of, is the following. Beſides thoſe internal powers of ſelf-preſervation in each individual, when two of them co-operate, or act in concert, they are endued with powers of making other animals or machines like themſelves, which again are poſſeſſed of the ſame powers of producing others, and ſo of multiplying the ſpecies without end.

Theſe are powers which mock all human invention or imitation. They are characteriſtics of the divine Architect.

Having premiſed this general account of the ſubject, we ſhall next conſider the method to be obſerved in treating it.

The ſtudy of the *human* body, as already noticed, is commonly divided into two parts. The firſt, which is called *Anatomy*, relates to the matter and ſtructure of its parts; the ſecond, called *Phyſiology* and *Animal œconomy*, relates to the principles and laws of its internal operations and functions.

As the body is a compound of ſolids and fluids, *Anatomy* is divided into,

1. The Anatomy of the ſolids, and
2. The Anatomy of the fluids.

I. The Solids, by which we mean all parts of our body, which are not fluid, are generally divided into two claſſes, viz.

1. The hard ſolids or bones. This part of anatomy is called *Oſteology*; which ſignifies the doctrine of the bones.

2. The ſofter ſolids; which part is called *Sarcology*, viz. the doctrine of fleſh.

This diviſion of the ſolids, we may obſerve, has probably taken its origin from the vulgar obſervation, that the body is made of bone and fleſh. And as there are many different kinds of what are called ſoft or fleſhy parts, Sarcology is ſubdivided into,

(1.) *Angeiology*, or the doctrine of veſſels; by which is commonly underſtood *blood-veſſels*:
(2.) *Adenology*, of glands:
(3.) *Neurology*, of nerves:
(4.) *Myology*, of muſcles: and,
(5.) *Splanchnology*, of the viſcera or bowels. There is, beſides, that part which treats of the organs of ſenſe and of the integuments.

This diviſion of the ſolids has been here mentioned, rather for the ſake of explaining ſo many words, which are conſtantly uſed by anatomiſts, than for its importance or accuracy. For beſides many other objections that might be urged, there are in the body three ſpecies of ſolids, viz. griſtle or cartilage, hair, and nails; which are of an intermediate nature between bone and fleſh; and therefore cannot ſo properly be brought into the oſteology or the ſarcology. The cartilages were claſſed with the bones; becauſe the greateſt number of them are appendages to bones: and for the like reaſon the hair and the nails were claſſed with the integuments.

II. The fluids of the human body may be divided into *three* kinds, which Dr Hunter calls the *crude*, the *general* or *perfect*, and the *local* or *ſecreted fluid*.

1. By the *crude* fluid is meant the chyle, and whatever is abſorbed at the ſurfaces of the body; in other words, what is recently taken into the body, and is not yet mixed with or converted into blood.

2. The *general* or *perfect* fluid is the blood itſelf; to wit, what is contained in the heart, arteries, and veins, and is going on in the round of the circulation.

3. The *local* or *ſecreted*, are thoſe fluids peculiar to particular parts of the body, which are ſtrained off from the blood, and yet are very different in their properties from the blood. They are commonly called *ſecretions*; and ſome are uſeful, others excrementitious.

In treating of the *Phyſiology*, it is very difficult to ſay what plan ſhould be followed; for every method which has been yet propoſed, is attended with manifeſt inconvenience.

convenience. The powers and operations of the machine have ſuch a dependence upon one another, ſuch connections and reciprocal influence, that they cannot well be underſtood or explained ſeparately. In this ſenſe our body may be compared to a circular chain of powers, in which nothing is firſt or laſt; nothing ſolitary or independent; ſo that wherever we begin, we find that there is ſomething preceding which we ought to have known. If we begin with the brain and the nerves, for example, we ſhall find that theſe cannot exiſt, even in idea, without the heart: if we ſet out with the heart and vaſcular ſyſtem, we ſhall preſently be ſenſible, that the brain and nerves muſt be ſuppoſed: or, ſhould we take up the mouth, and follow the courſe of the aliment, we ſhould ſee that the very firſt organ which preſents itſelf, ſuppoſed the exiſtence of both the heart and brain: Wherefore we ſhall incorporate the Phyſiology with the Anatomy, by attempting to explain the functions after we have demonſtrated the organs.

PART I. OSTEOLOGY.

WE begin with the bones, which may be conſidered as the great ſupport of the body, tending to give it ſhape and firmneſs.—But before we enter into the detail of each particular bone, it will be neceſſary to deſcribe their compoſition and connections, and to explain the nature of the different parts which have an immediate relation to them; as the cartilages, ligaments, perioſteum, marrow, and ſynovial glands.

SECT. I. *Of the Bones in general, with their Appendages*, &c.

1 Of the compoſition of the bones.

THE bones are of a firm and hard (B) ſubſtance, of a white colour, and perfectly inſenſible. They are the moſt compact and ſolid parts of the body, and ſerve for the attachment and ſupport of all the other parts.

Three different ſubſtances are uſually diſtinguiſhed in them; their exterior or bony part, properly ſo called; their ſpongy cells; and their reticular ſubſtance. The firſt of theſe is formed of many laminæ or plates, compoſing a firm hard ſubſtance—The ſpongy or cellular part is ſo called on account of its reſemblance to a ſponge, from the little cells which compoſe it. This ſubſtance forms almoſt the whole of the extremities of cylindrical bones. The reticular part is compoſed of fibres, which croſs each other in different directions. This net-work forms the internal ſurface of thoſe bones which have cavities.

The flat bones, as thoſe of the head, are compoſed only of the laminæ and the cellular ſubſtance. This laſt is uſually found in the middle of the bone dividing it into two plates, and is there called *diploë*.

Gagliardi, who pretended to have diſcovered an infinite number of claviculi (C), or bony proceſſes, which he deſcribes as traverſing the laminæ to unite them together, has endeavoured to ſupport this pretended diſcovery by the analogy of bones to the bark of trees, in which certain woody nails have been remarked; but this opinion ſeems to be altogether fanciful.

Some writers have ſuppoſed, that the bones are formed by layers of the perioſteum, which gradually oſſify, in the ſame manner as the timber is formed in trees by the hardening of the white ſubſtance that is found between the inner bark and the wood. M. Duhamel, who has adopted this opinion, fed different animals with madder and their ordinary food alternately during a certain time; and he aſſerts, that in diſſecting their bones, he conſtantly obſerved diſtinct layers of red and white, which correſponded with the length of time they had lived on madder or their uſual aliment. But it has ſince been proved by Detleff, that M. Duhamel's experiments were inaccurate, and that neither the perioſteum nor the cartilages are tinged by the uſe of madder, which is known to affect the bones only.

We uſually conſider in a bone, its body and its extremities. The ancients gave the name of diaphyſis to the body or middle part, and divided the extremities into apophyſis and epiphyſis. An apophyſis, or proceſs, as it is more commonly called, is an eminence continued from the body of the bone, whereas an epiphyſis is at firſt a ſort of appendage to the bone, by means of an intermediate cartilage. Many epiphyſes, which appear as diſtinct bones in the fœtus, afterwards become apophyſes; for they are at length ſo completely united to the body of the bone as not to be diſtinguiſhable from it in the adult ſtate. It is not unuſual, however, at the age of 18 and even 20 years, to find the extremities of bones ſtill in the ſtate of epiphyſis.

The names given to the proceſſes of bones are expreſſive of their ſhape, ſize, or uſe; thus if a proceſs is large and of a ſpherical form, it is called *caput*, or *head*; if the head is flatted, it is termed *condyle*. Some proceſſes, from their reſemblance to a ſtiletto, a breaſt, or the beak of a crow, are called *ſtyloid*, *maſtoid*, or *coracoid*: others are ſtyled *ridges* or *ſpines*. The two proceſſes of the os femoris derive their name of *trochanters* from their uſe.

A bone has its cavities as well as proceſſes. Theſe cavities either extend quite through its ſubſtance, or appear only as depreſſions. The former are called *foramina* or *holes*, and theſe foramina are ſometimes termed *canals* or *conduits*, according to their form and extent. Of the depreſſions, ſome are uſeful in articulation. Theſe are called *cotyloid* when they are deep, as is the caſe with the os innominatum, where it receives the head of the os femoris; or *glenoid* when they are ſuperficial, as in the ſcapula, where it receives the os humeri. Of the depreſſions that are not deſigned for

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(B) Mr Scheele has lately diſcovered that bones contain the phoſphoric acid united with calcareous earth; and that to this combination they owe their firmneſs.

(C) In his *Anat. oſſium nov. invent. illuſtrat.* he deſcribes four kinds of theſe claviculi or nails, viz. the perpendicular, oblique, headed, and crooked.

for articulation, thoſe which have ſmall apertures are called *ſinuſes;* others that are large, and not equally ſurrounded by high brims, are ſtyled *foſſæ;* ſuch as are long and narrow, *furrows;* or if broad and ſuperficial without brims, *ſinuoſities.* Some are called *digital impreſſions,* from their reſemblance to the traces of a finger on ſoft bodies.

2
Connection of the bones.

We ſhall abridge this article, which is exceedingly diffuſe in the generality of anatomical books, and will endeavour to deſcribe it with all the clearneſs it will allow.

The bones compoſing the ſkeleton are ſo conſtructed, that the end of every bone is perfectly adapted to the extremity of that with which it is connected, and this connection forms what is called their *articulation.*

Articulation is divided into *diarthroſis, ſynarthroſis,* and *amphiarthroſis,* or moveable, immovable, and mixed articulation. Each of the two firſt has its ſubdiviſions. Thus the *Diarthroſis,* or moveable articulation, includes, 1. The enarthroſis, as it is called, when a large head is admitted into a deep cavity, as in the articulation of the os femoris with the os innominatum. 2. Arthrodia, when a round head is articulated with a ſuperficial cavity, as is the caſe of the os humeri and ſcapula. 3. Ginglimus, or hinge-like articulation, as in the connection of the thigh-bone with the tibia. The enarthroſis and arthrodia allow of motion to all ſides; the ginglimus only of flexion and extenſion.

The *ſynarthroſis,* or immoveable articulation, includes, 1. The ſuture, when the two bones are indented into each other, as is the caſe with the parietal bones. 2. Gomphoſis, when one bone is fixed into another, in the manner the teeth are placed in their ſockets.

The term *amphiarthroſis* is applied to thoſe articulations which partake both of the ſynarthroſis and diarthroſis, as is the caſe with the bones of the vertebræ, which are capable of motion in a certain degree, although they are firmly connected together by intermediate cartilages.

What is called *ſymphyſis* is the union of two bones into one; as in the lower jaw, for inſtance, which in the fœtus conſiſts of two diſtinct bones, but becomes one in a more advanced age, by the oſſification of the uniting cartilage.

When bones are thus joined by the means of cartilages, the union is ſtyled *ſynchondroſis;* when by ligaments, *ſyneuroſis.*

3
Of the Cartilages.

Cartilages are white, ſolid, ſmooth, and elaſtic ſubſtances, between the hardneſs of bones and ligaments, and ſeemingly of a fibrous texture. We are not able to trace any veſſels into their ſubſtance by injection, nor are they ever found tinged in animals that have been fed with madder.

They may be diſtinguiſhed into, 1ſt, Thoſe which are connected with the bones; and, 2dly, Thoſe which belong to other parts of the body. The firſt ſerve either to cover the ends and cavities of bones intended for motion, as in the articulations, where by their ſmoothneſs they facilitate motions, which the bones alone could not execute with ſo much freedom; or they ſerve to unite bones together, as in the ſymphyſis pubis, or to lengthen them, as in the ribs.

Many of them oſſifying as we advance in life, their number is leſs in the adult than in the fœtus, and of courſe there are fewer bones in the old than in the young ſubject.

Of the ſecond claſs of cartilages, or thoſe belonging to the ſoft parts, we have inſtances in the larynx, where we find them uſeful in the formation of the voice, and for the attachment of muſcles.

4
Of the Perioſteum.

The perioſteum is a fine membrane of a compact cellular texture, reflected from one joint to another, and ſerving as a common covering to the bones. It has ſanguiferous and lymphatic veſſels, and is ſupplied with nerves from the neighbouring parts. It adheres very firmly to their ſurface, and by its ſmoothneſs facilitates the motion of muſcles. It likewiſe ſupports the veſſels that go to be diſtributed through the ſubſtance of the bones, and may ſerve to ſtrengthen the articulations. At the extremities of bones, where it is found covering a cartilage, it has by ſome been improperly conſidered as a diſtinct membrane, and named *perichondrium.* This, in its uſe and ſtructure, reſembles the perioſteum. Where it covers the bones of the ſkull, it has gotten the name of *pericranium.*

The perioſteum is not a production of the dura mater, as the ancients, and after them Havers, imagined; nor are the bones formed by the oſſification of this membrane, at leaſt when it is in a ſound ſtate, as ſome late writers have ſuppoſed.

The perioſteum is deficient in the teeth above the ſockets, and in thoſe parts of bones to which ligaments or tendons are attached.

5
Of the Marrow.

The marrow is a fat oily ſubſtance, filling the cavities of bones. In the great cavities of long bones it is of a much firmer conſiſtence than in the cells of their ſpongy part. In the former it inclines ſomewhat to a yellowiſh tinge, and is of the conſiſtence of fat; in the latter it is more fluid, and of a red colour. This difference in colour and conſiſtence is owing to accidental cauſes; both kinds are of the ſame nature, and may both be deſcribed under the common name of marrow, though ſome writers give the name only to the fat-like ſubſtance, and call the other the medullary juice.

The marrow is contained in a very fine and tranſparent membrane, which is ſupplied with a great number of blood veſſels, chiefly from the perioſteum. This membrana medullaris adheres to the inner ſurface of the bones, and furniſhes an infinite number of minute bags or veſicles for incloſing the marrow, which is likewiſe ſupported in the cavities of the bones by the long filaments of their reticular ſubſtance.

Beſides the veſſels from the perioſteum, the membrana medullaris is furniſhed with others, which in the long bones may be ſeen paſſing in near the extremities of the bone, and ſending off numerous branches that ramify through all the veſicles of this membrane.

The bones, and the cells containing the marrow, are likewiſe furniſhed with lymphatics. By their means, the marrow, like the fat, may be taken up in a greater quantity than it is ſecreted; and hence it is that ſo little are found in the bones of thoſe who die of lingering diſeaſes.

It is ſtill a matter of controverſy, Whether the marrow is ſenſible or not? We are certainly not able to trace any nerves to it; and from this circumſtance, and its analogy to fat, Haller has ventured to conſider it as inſenſible. On the other hand, Duverney aſſerts, that an injury done to this ſubſtance in a living animal was attended with great pain. In this diſpute phyſiologiſts do not ſeem to have ſufficiently diſcriminated between the marrow itſelf and the membranous cells in which it is contained. The former, like the fat, being nothing more than a ſecreted, and of courſe an inorganized, matter, may with propriety be ranked among the inſenſible parts, as much as inſpiſſated mucus or any other ſecreted matter in the body; whereas the membrana medullaris being vaſcular, though it poſſeſſes but an obſcure degree of feeling in a ſound ſtate, is not perfectly inſenſible.

The marrow was formerly ſuppoſed to be intended for the nouriſhment and renewal of the bones; but this doctrine is now pretty generally and deſervedly exploded. It ſeems probable that the marrow is to the bones what fat is to the ſoft parts. They both ſerve for ſome important purpoſes in the animal œconomy; but their particular uſe has never yet been clearly aſcertained. The marrow, from the tranſudation of the oil through the bones of a ſkeleton, is ſuppoſed to diminiſh their brittleneſs; and Havers, who has written profeſſedly on the bones, deſcribes the canals by which the marrow is conveyed through every part of their ſubſtance, and divides them into longitudinal and tranſverſe ones. He ſpeaks of the firſt as extending through the whole length of the bone; and of the latter, as the paſſages by which the longitudinal ones communicate with each other. The ſimilarity of theſe to the large cancelli in burnt bones, and the tranſudation of the oil through the bones of the ſkeleton, ſeems to prove that ſome ſuch paſſages do actually exiſt.

6
ynovial
lands.

The ſynovial glands are ſmall bodies (D), ſuppoſed to be of a glandular ſtructure, and exceedingly vaſcular, ſecreting a fluid of a clear mucilaginous nature, which ſerves to lubricate the joints. They are placed in ſmall cavities in the articulations, ſo as to be capable of being gently compreſſed by the motion of the joint, which expreſſes their juice in proportion to the degree of friction. When the ſynovia is wanting, or is of too thick a conſiſtence, the joint becomes ſtiff and incapable of flexion or extenſion. This is what is termed *anchyloſis*.

7
f the Li-
aments.

Ligaments are white, gliſtening, inelaſtic bands, of a compact ſubſtance, more or leſs broad or thick, and ſerving to connect the bones together. They are diſtinguiſhed by different names adapted to their different forms and uſes. Thoſe of the joints are called either round or burſal. The round ligaments are white, tendinous, and inelaſtic. They are ſtrong and flexible, and are found only in the joint of the knee, and in the articulation of the os femoris with the os innominatum. The burſal, or capſular ligaments, ſurround the whole joint like a purſe, and are to be found in the articulations which allow motion every way, as in the articulation of the arm with the ſcapula.

8
f the
urſæ mu-
oſæ.

Of thoſe ſacs called *Burſæ mucoſæ*, a few were known to former anatomiſts, but by much the greater number have been ſince diſcovered by Dr Monro (E), who obſerves, that they are to be met with in the extremities of the body only; that many of them are placed entirely on the inner ſides of the tendons, between theſe and the bones. Many others cover not only the inner, but the outer ſides of the tendons, or are interpoſed between the tendons and external parts, as well as between thoſe and the bones.

Some are ſituated between the tendons and external parts only or chiefly, ſome between contiguous tendons, or between the tendons or the ligaments and the joints. A few ſuch ſacs are obſerved where the proceſſes of bones play upon the ligaments, or where one bone plays upon another. Where two or more tendons are contiguous, and afterwards ſeparate from each other, we generally find a common burſa divided into branches, with which it communicates; and a few burſæ of contiguous tendons communicate with each other.—Some, in healthy children, communicate with the cavities of the joints; and in many old people he has ſeen ſuch communications formed by uſe or worn by friction, independent of diſeaſe.

Their proper membrane is thin and tranſparent, but very denſe, and capable of confining air or any other fluid. It is joined to the neighbouring parts by the common cellular ſubſtance. Between the burſa and the hard ſubſtance of bone, a thin layer of cartilage or of tough membrane is very generally interpoſed. To the cellular ſubſtance on the outſide of the burſa, the adipoſe ſubſtance is connected; except where the burſa covers a tendon, cartilage, or bone, much expoſed to preſſure or friction.

In ſeveral places a maſs of fat, covered with the continuation of the membrane of the burſa, projects into its cavity. The edges of this are divided into fringes.

The inner ſide of the membrane is ſmooth, and is extremely ſlippery from the liquor ſecreted in it.

9
Their ſtructure compared with that of the capſular ligaments of the joints.

The ſtructure of the burſæ bears a ſtrong reſemblance to the capſular ligaments of the joints. 1. The inner layer of the ligament, like that of the burſæ, is thin and denſe. 2. It is connected to the external ligaments by the common cellular ſubſtance. 3. Between it and the bones, layers of cartilage, or the articular cartilages, are interpoſed. 4. At the ſides of the joints, where it is not ſubjected to violent preſſure and friction, the adipoſe ſubſtance is connected with the cellular membrane. 5. Within the cavities of the joints we obſerve maſſes of fat projecting, covered with ſimilar blood-veſſels, and with ſimilar fimbriæ hanging from their edges. 6. In the knee the upper part of ſuch a maſs of fat forms what has been called the *mucilaginous gland of the joint*, and the under part projects into the burſa behind the ligament which ties the patella to the tibia. 7. The liquor which lubricates the burſæ has the ſame colour, conſiſtence, and properties as that of the joints, and both are affected in the ſame manner by heat, mineral acids, and ardent ſpirits. 8. In ſome places the burſæ conſtantly communicate with the cavities of the joints, in others they generally do ſo; from which we may infer a ſameneſs of ſtructure.

When we examine the fimbriæ common to the fatty bodies of the joints and burſæ, and which have been ſuppoſed to be the ducts of glands lodged within the maſſes

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(D) It is now much doubted, however, whether the appearances in the joints, which are uſually called *glands*, are any thing more than aſſemblages of fat.

(E) See *Deſcription of the Burſæ Mucoſæ*, &c.

maſſes of fat, we are not able to diſcover any glandular appearance within them. And although we obſerve many veſſels diſperſed upon the membranes of the fatty bodies and fimbriæ; and that we cannot doubt that theſe fimbriæ conſiſt of ducts which contain a lubricating liquor, and can even preſs ſuch a liquor from them; yet their cavities and orifices are ſo minute, that they are not diſcoverable even by the aſſiſtance of magnifying-glaſſes. Theſe fimbriæ appear, therefore, to be ducts like thoſe of the urethra, which prepare a mucilaginous liquor without the aſſiſtance of any knotty or glandular organ.

Upon the whole, the ſynovia ſeems to be furniſhed by inviſible exhalent arteries by the ducts of the fimbriæ, and by oil exuding from the adipoſe follicles by paſſages not yet diſcovered.

10 Of the Skeleton.

The word *ſkeleton*, which by its etymology implies ſimply a dry preparation, is uſually applied to an aſſemblage of all the bones of an animal united together in their natural order. It is ſaid to be a natural ſkeleton, when the bones are connected together by their own proper ligaments; and an artificial one, when they are joined by any other ſubſtance, as wire, &c.

The ſkeleton is generally divided into the head, trunk, and extremities. The firſt diviſion includes the bones of the cranium and face. The bones of the trunk are the ſpine, ribs, ſternum, and bones of the pelvis.

The upper extremity on each ſide conſiſts of the two bones of the ſhoulder, viz. the ſcapula and clavicle; the bone of the arm, or os humeri; the bones of the fore-arm, and thoſe of the hand.

The lower extremity on each ſide of the trunk conſiſts of the thigh-bone and the bones of the leg and foot.

Sect. II. *Of the Bones of the Head.*

The head is of a roundiſh figure, and ſomewhat oval (f). Its greateſt diameter is from the forehead to the occiput; its upper part is called *vertex*, or crown of the head; its anterior or fore-part the face; and the upper part of this *ſinciput*, or forehead; its ſides the temples; its poſterior, or hind-part, the *occiput;* and its inferior part the *baſis*.

The ~~bones of~~ the head may be divided into thoſe of the cranium and face.

§ 1. *Bones of the Cranium and Face.*

There are eight bones of the cranium, viz. the coronal bone, or os frontis; the two parietal bones, or oſſa bregmatis; the os occipitis; the two temporal bones; the ſphenoid bone; and the os ethmoides, or cribriforme.

11. Of theſe, only the os occipitis and oſſa bregmatis are conſidered as proper to the cranium; the reſt being common both to the cranium and face.

Theſe bones are all harder at their ſurface than in their middle; and on this account they are divided into two tables, and a middle ſpongy ſubſtance called *diploë*.

12 Of the Os Frontis.

In this, as in all the other bones, we ſhall conſider its figure, ſtructure, proceſſes, depreſſions, and cavities; and the manner in which it is articulated with the other bones.

The os frontis has ſome reſemblance in ſhape to the ſhell of the cockle. Externally it is convex, its concave ſide being turned towards the brain. This bone, in the places where it is united to the temporal bones, is very thin, and has there no diploë. It is likewiſe exceedingly thin in that part of the orbit of the eye which is neareſt to the noſe. Hence it is, that a wound in the eye, by a ſword or any other pointed inſtrument, is ſometimes productive of immediate death. In theſe caſes, the ſword paſſing through the weak part of the bone, penetrates the brain, and divides the nerves at their origin; or perhaps opens ſome blood-veſſel, the conſequences of which are ſoon fatal.

We obſerve on the exterior ſurface of this bone five apophyſes or proceſſes, which are eaſily to be diſtinguiſhed. One of theſe is placed at the bottom and narroweſt part of the bone, and is called the naſal proceſs, from its ſupporting the upper end of the bones of the noſe. The four others are called angular or orbitar proceſſes. They aſſiſt to form the orbits, which are the cavities on which the eyes are placed. In each of theſe orbits there are two proceſſes, one at the interior or great angle, and the other at the exterior or little angle of the orbit. They are called the angular proceſſes. Between theſe a ridge is extended in form of an arch, and on this the eye-brows are placed. It is called the orbitar or ſuperciliary ridge, and in ſome meaſure covers and defends the globe of the eye. There is a hole in this for the paſſage of the frontal veſſels and nerves. This arch is interrupted near the noſe by a ſmall pit, in which the tendon of the muſculus obliquus major of the eye is fixed. From the under part of each ſuperciliary ridge a thin plate runs a conſiderable way backwards, and has the name of *orbitar;* the external and fore-part of this plate forms a ſinuoſity for lodging the lacrymal gland. Between the orbitar plates there is a large diſcontinuation of the bone, which is filled up by the cribriform part of the os ethmoides.

On examining the inner ſurface of this bone at its under and middle part, we obſerve an elevation in form of a ridge, which has been called the *ſpinous proceſs;* it aſcends for ſome way, dividing the bone into two conſiderable foſſæ, in which the anterior lobes of the brain are placed. To a narrow furrow in this ridge is attached the extremity of the falx, as the membrane is called, which divides the brain into two hemiſpheres. The furrow becoming gradually wider, is continued to the upper and back part of the bone. It has the falx fixed

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(f) The bones of the fœtus being perfectly diſtinct, and the muſcles in young perſons not acting much, the ſhape of the head has been ſuppoſed to depend much on the management of children when very young. Veſalius, who has remarked the difference in people of different nations, obſerves, for inſtance, that the head of a Turk is conical, from the early uſe of the turban; whilſt that of an Engliſhman is flattened by the chin-ſtay. Some of the lateſt phyſiologiſts ſuppoſe, with good reaſon, that this difference is chiefly owing to certain natural cauſes with which we are as yet unacquainted.

fixed to it, and part of the longitudinal ſinus lodged in it. Beſides the two foſſæ, there are many depreſſions, which appear like digital impreſſions, and owe their formation to the prominent circumvolutions of the brain.

In the fœtus, the forehead is compoſed of two diſtinct bones; ſo that in them the ſagittal ſuture reaches from the os occipitis to the noſe. This bone is almoſt every where compoſed of two tables and a diploë. Theſe two tables ſeparating from each other under the eyes, form two cavities, one on each ſide of the face, called the frontal ſinuſes. Theſe ſinuſes are lined with a ſoft membrane, called *membrana pituitaria*. In theſe ſinuſes a mucus is ſecreted, which is conſtantly paſſing through two ſmall holes into the noſtrils, which it ſerves to moiſten.

The os frontis is joined by ſuture to many of the bones of the head, viz. to the parietal, maxillary, and temporal bones; to the os ethmoides; os ſphenoides; os unguis; and oſſa naſi. The ſuture which connects it with the parietal bones is called the *coronal ſuture*.

13 Of the parietal bones

The parietal bones are two in number; they are very thin, and even tranſparent in ſome places. The particular figure of each of theſe bones is that of an irregular ſquare, bordered with indentations through its whole circumference, except at its lower part. It will be eaſily conceived, that theſe bones which compoſe the ſuperior and lateral parts of the cranium, and cover the greateſt part of the brain, form a kind of vault. On their inner ſurface we obſerve the marks of the veſſels of the dura mater; and at their upper edge the groove for the ſuperior longitudinal ſinus.

The oſſa parietalia are joined to each other by the ſagittal ſuture; to the os ſphenoides and oſſa temporum by the ſquamous ſuture; to the os occipitis by the lambdoidal ſuture (c), ſo called from its reſemblance to the Greek letter lambda; and to the os frontis by the coronal ſuture.

In the fœtus, the parietal bones are ſeparated from the middle of the divided os frontis by a portion of the cranium then unoſſified.

14 Of the occipital bone

The occipital bone forms the poſterior and inferior parts of the ſkull; it approaches nearly to the ſhape of a lozenge, and is indented throughout three parts of its circumference.

There is a conſiderable hole in the inferior portion of this bone, called the *foramen magnum*, through which the medulla oblongata paſſes into the ſpine.—The nervi acceſſorii, and vertebral arteries, likewiſe paſs through it. Behind the condyles are two holes for the paſſage of cervical veins into the lateral ſinuſes; and above them are two others for the paſſage of the eighth pair and acceſſory nerves out of the head. At the ſides, and a little on the anterior part of the foramen magnum, are two proceſſes, called the condyles, one on each ſide; they are of an oval figure, and are covered with cartilage.

The external ſurface of this bone has a large tranſverſe arched ridge, under which the bone is very irregular, where it affords attachment to ſeveral muſcles. On examining its inner ſurface, we may obſerve two ridges in form of a croſs; one aſcending from near the foramen magnum to the top of the bone; the upper end of this in which the falx is fixed, is hollow, for lodging the ſuperior longitudinal ſinus, and the under end has the third proceſs of the dura mater fixed to it. The other ridge, which runs horizontally, is likewiſe hollow for containing the lateral ſinuſes. Four foſſæ are formed by the croſs, two above and two below. In the former are placed the poſterior lobes of the brain, and in the latter the lobes of the cerebellum.

At the baſis of the cranium, we obſerve the cuneiform proceſs (which is the name given to the great apophyſis at the fore part of this bone); it ſerves for the reception of the medulla oblongata.

The os occipitis is of greater ſtrength and thickneſs than either of the other bones of the head, though irregularly ſo; at its inferior part, where it is thinneſt, it is covered by a great number of muſcles.

This bone, from its ſituation, being more liable to be injured by falls, than any other bone of the head, nature has wiſely given it the greateſt ſtrength at its upper part, where it is moſt expoſed to danger.

It is joined to the parietal bones by the lambdoidal ſuture, and to the oſſa temporum, by the additamentum of the temporal ſuture. It is likewiſe connected to the os ſphenoides by the cuneiform proceſs. It is by means of the os occipitis that the head is united to the trunk, the two condyles of this bone being connected to the ſuperior oblique proceſſes of the firſt vertebra of the neck.

15 Of the temporal bones

There are two temporal bones, one on each ſide.—We may diſtinguiſh in them two parts; one of which is called the *ſquamous* or *ſcaly part*, and the other *pars petroſa* from its hardneſs. This laſt is ſhaped like a pyramid.

Each of theſe diviſions affords proceſſes and cavities: externally there are three proceſſes; one anterior, called the zygomatic proceſs; one poſterior, called the *maſtoid* or *mamillary proceſs*, from its reſemblance to a nipple; and one inferior, called the *ſtyloid proceſs*, becauſe it is ſhaped like a ſtiletto, or dagger.

The cavities are, 1. The meatus auditorius externus. 2. A large foſſa which ſerves for the articulation of the lower jaw; it is before the meatus auditorius, and immediately under the zygomatic proceſs. 3. The ſtylo-maſtoid hole, ſo called from its ſituation between the ſtyloid and maſtoid proceſſes; it is likewiſe ſtyled the aquæduct of Fallopius, and affords a paſſage to the portio dura of the auditory, or ſeventh pair of nerves. 4. Below, and on the fore-part of the laſt foramen, we obſerve part of the jugular foſſa, in which the beginning of the internal jugular vein is lodged. Anterior and ſuperior to this foſſa is the orifice of a foramen, through which paſſes the carotid artery. This foramen runs firſt upwards and then forwards, forming a kind of elbow, and terminates at the end of the os petroſum.—At this part of each temporal bone, we may obſerve the opening of the Euſtachian tube, a canal which paſſes from the ear to the back part of the noſe.

In examining the internal ſurface of theſe bones, we may remark the triangular figure of their petrous part which ſeparates two foſſæ; one ſuperior and anterior; the other inferior and poſterior: the latter of theſe compoſes part of the foſſa, in which the cerebellum is

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(c) The lambdoidal ſuture is ſometimes very irregular, being compoſed of many ſmall ſutures, which ſurround ſo many little bones called *oſſa triquetra*, though perhaps improperly, as they are not always triangular.

placed; and the former, a portion of the leaſt foſſa for the baſis of the brain. On the poſterior ſide of the pars petroſa, we obſerve the meatus auditorus internus, into which enters the double nerve of the ſeventh pair. On the under ſide of this proceſs, part of a hole appears, which is common to the temporal and occipital bones; through it the lateral ſinus, the eighth pair, and acceſſory nerves, paſs out of the head.

The pars petroſa contains ſeveral little bones called the bones of the ear; which, as they do not enter into the formation of the cranium, ſhall be deſcribed when we are treating of the organs of hearing.

The oſſa temporum are joined to the oſſa malarum, by the zygomatic ſutures; to the parietal bones, by the ſquamous ſutures; to the os occipitis, by the lambdoidal ſuture; and to the ſphenoid bone, by the ſuture of that name.

16 Of the os ſphenoides.

This bone, from its ſituation amidſt the other bones of the head, has ſometimes been called *cuneiforme*. It is of a very irregular figure, and has been compared to a bat with its wings extended.

It is commonly divided into its middle part or body, and its ſides or wings.

The fore part of the body has a ſpine or ridge, which makes part of the ſeptum narium. The upper part of each wing forms a ſhare of the temple. The fore part of this belongs to the orbit; while the under and back part, termed *ſpinous proceſs*, is lodged in the baſe of the ſkull at the point of the pars petroſa. But two of the moſt remarkable proceſſes are the ptergoid or aliform, one on each ſide of the body of the bone, and at no great diſtance from it. Each of theſe proceſſes is divided into two wings, and of theſe the exterior one is the wideſt. The other terminates in a hook-like proceſs.

The internal ſurface of this bone affords three foſſæ. Two of theſe are formed by the wings of the bone, and make a part of the leſſer foſſæ of the baſis of the cranium. The third, which is ſmaller, is on the top of the body of the bone; and is called *ſella turcica*, from its reſemblance to a Turkiſh ſaddle. This foſſa, in which the pituitary gland is placed, has poſteriorly and anteriorly proceſſes called the *clinoid proceſſes*.

There are twelve holes in this bone, viz. ſix on each ſide. The firſt is the paſſage of the optic nerve and ocular artery; the ſecond, or large ſlit, tranſmits the third, fourth, ſixth, and firſt part of the fifth pair of nerves with the ocular vein; the third hole gives paſſage to the ſecond branch of the fifth pair; and the fourth hole to the third branch of the fifth pair of nerves. The fifth hole is the paſſage of the artery of the dura mater. The ſixth hole is ſituated above the ptergoid proceſs of the ſphenoid bone; through it a reflected branch of the ſecond part of the fifth pair paſſes.

Within the ſubſtance of the os ſphenoides there are two ſinuſes ſeparated by a bony plate. They are lined with the pituitary membrane; and, like the frontal ſinuſes, ſeparate a mucus which paſſes into the noſtrils.

The os ſphenoides is joined to all the bones of the cranium; and likewiſe to the oſſa maxillaria, oſſa malarum, oſſa palati, and vomer.

This bone makes part of the baſis of the ſkull, aſſiſts in forming the orbits, and affords attachment to ſeveral muſcles.

The os ethmoides is ſituated at the fore part of the baſis of the cranium, and is of a very irregular figure. From the great number of holes with which it is pierced, it is ſometimes called *os cribriforme* or ſieve-like bone.

17 Of the os ethmoides or cribriforme.

It conſiſts of a middle part and two ſides. The middle part is formed of a thin bony plate, in which are an infinite number of holes that afford a paſſage to filaments of the olfactory nerve. From the middle of this plate, both on the outſide and from within, there riſes up a proceſs, which may be eaſily diſtinguiſhed. The inner one is called *criſta galli*, from its ſuppoſed reſemblance to a cock's comb. To this proceſs the falx of the dura mater is attached. The exterior proceſs, which has the ſame common baſis as the criſta galli, is a fine lamella which is united to the vomer; and divides the cavity of the noſtrils, though unequally, it being generally a little inclined to one ſide.

The lateral parts of this bone are compoſed of a cellular ſubſtance; and theſe cells are ſo very intricate, that their figure or number cannot be deſcribed. Many writers have on this account called this part of the bone the *labyrinth*. Theſe cells are externally covered with a very thin bony lamella. This part of the bone is called the *os planum*, and forms part of the orbit.

The different cells of this bone, which are numerous, and which are every where lined with the pituitary membrane, evidently ſerve to enlarge the cavity of the noſe, in which the organ of ſmelling reſides.

This bone is joined to the os ſphenoides, os frontis, oſſa maxillaria, oſſa palati, oſſa naſi, oſſa unguis, and vomer.

The ancients, who conſidered the brain as the ſeat of all the humours, imagined that this viſcus diſcharged its redundant moiſture through the holes of the ethmoid bone. And the vulgar ſtill think, that abſceſſes of the brain diſcharge themſelves through the mouth and ears, and that ſnuff is liable to get into the head; but neither ſnuff nor the matter of an abſceſs are more capable of paſſing through the cribriform bone, than the ſeroſity which they ſuppoſed was diſcharged through it in a common cold.—All the holes of the ethmoid bone are filled up with the branches of the olfactory nerve. Its inner part is likewiſe covered with the dura mater, and its cells are every where lined with the pituitary membrane; ſo that neither matter nor any other fluid can poſſibly paſs through this bone either externally or internally. Matter is indeed ſometimes diſcharged through the noſtrils; but the ſeat of the diſeaſe is in the ſinuſes of the noſe, and not in the brain; and impoſthumations are obſerved to take place in the ear, which ſuppurate and diſcharge themſelves externally.

Before we leave the bones of the head, we wiſh to make ſome general obſervations on its ſtructure and figure.—As the cranium might have been compoſed of a ſingle bone, the articulation of its ſeveral bones being abſolutely without motion, it may be aſked perhaps, Why ſuch a multiplicity of bones, and ſo great number of ſutures? Many advantages may poſſibly ariſe from this plurality of bones and ſutures, which may not yet have been obſerved. We are able, however, to point out many uſeful ends, which could only be accompliſhed by this peculiarity of ſtructure.—In this, as in all the other works of nature, the great wiſdom of the Creator is evinced, and cannot fail to excite our admiration and gratitude.

The cranium, by being divided into ſeveral bones, grows much faſter and with greater facility, than if it was compoſed of one piece only. In the fœtus, the bones, as we have before obſerved, are perfectly diſtinct from each other. The oſſification begins in the middle of each bone, and proceeds gradually to the circumference. Hence the oſſification, and of courſe the increaſe of the head, is carried on from an infinite number of points at the ſame time, and the bones conſequently approach each other in the ſame proportion. To illuſtrate this doctrine more clearly, if it can want further illuſtration, ſuppoſe it neceſſary for the parietal bones which compoſe the upper part of the head, to extend their oſſification, and form the fore part of the head likewiſe.—Is it not evident, that this proceſs would be much more tedious than it is now, when the os frontis and the parietal bones are both growing at the ſame time? Hence it happens, that the heads of young people, in which the bones begin to touch each other, increaſe ſlowly; and that the proportionate increaſe of the volume of the head is greater in three months in the fœtus, than it is perhaps in twenty-four months at the age of fourteen or fifteen years.

The ſutures, excluſive of their advantage in ſuſpending the proceſſes of the dura mater, are evidenly of great utility in preventing the too great extent of fractures of the ſkull.—Suppoſe, for inſtance, that by a fall or blow, one of the bones of the cranium becomes fractured. The fiſſure, which in a head compoſed of only one bone, would be liable to extend itſelf through the whole of it, is checked, and ſometimes perhaps ſtopped by the firſt ſuture it meets, and the effects of the injury are confined to the bone on which the blow was received. Ruyſch indeed, and ſome others, will not allow the ſutures to be of any ſuch uſe; but caſes have been met with where they ſeemed to have had this effect, and in young ſubjects their utility in this reſpect muſt be ſtill more obvious.

The ſpherical ſhape of the head ſeems likewiſe to render it more capable of reſiſting external violence than any other ſhape would do. In a vault, the parts mutually ſupport and ſtrengthen each other, and this happens in the cranium.

§ 2. *Proper Bones of the Face.*

18 Of the bones of the face. THE face, which conſiſts of a great number of bones, is commonly divided into the upper and lower jaws. The upper jaw conſiſts of thirteen bones, excluſive of the teeth. Of theſe, ſix are placed on each ſide of the maxilla ſuperior, and one in the middle.

The bones, which are in pairs, are the oſſa malarum, oſſa maxillaria, oſſa naſi, oſſa unguis, oſſa palati, and oſſa ſpongioſa inferiora. The ſingle bone is the vomer.

19 Of the oſſa malarum. Theſe are the prominent ſquare bones which are placed under the eyes, forming part of the orbits and the upper part of the cheeks. Each of them affords three ſurfaces; one exterior and a little convex; a ſecond ſuperior and concave, forming the inferior part and ſides of the orbit; and a third poſterior, irregular, and hollowed for the lodgement of the lower part of the temporal muſcle.

The angles of each bone form four proceſſes, two of which may be called *orbitar proceſſes*; of theſe the upper one is joined by ſuture to the os frontis, and that below to the maxillary bone. The third is connected with the os ſphenoides by means of the tranſverſe ſuture; and the fourth is joined to the zygomatic proceſs of the temporal bone, with which it forms the zygoma.

20 Of the oſſa maxillaria ſuperiora. Theſe bones, which are of a very irregular figure, are ſo called becauſe they form the moſt conſiderable portion of the upper jaw. They are two in number, and generally remain diſtinct through life.

Of the many proceſſes which are to be ſeen on theſe bones, and which are connected with the bones of the face and ſkull, we ſhall deſcribe only the moſt remarkable.

One of theſe proceſſes is at the upper and fore part of the bone, making part of the ſide of the noſe, and called the *naſal proceſs*. Another forms a kind of circular ſweep at the inferior part of the bone, in which are the alveoli or ſockets for the teeth: this is called the *alveolar proceſs*. A third proceſs is united to the os malæ on each ſide. Between this and the naſal proceſs there is a thin plate, which forms a ſhare of the orbit, and lies over a paſſage for the ſuperior maxillary veſſels and nerves.—The alveolar proceſs has poſteriorly a conſiderable tuberoſity on its internal ſurface, called the *maxillary tuberoſity*.

Behind the alveolar proceſs we obſerve two horizontal lamellæ, which uniting together, form a part of the roof of the mouth, and divide it from the noſe. The hollowneſs of the roof of the mouth is owing to this partition's being ſeated ſomewhat higher than the alveolar proceſs.—At the fore part of the horizontal lamellæ there is a hole called *foramen inciſivum*, through which ſmall blood-veſſels and nerves go between the mouth and noſe.

In viewing theſe bones internally, we obſerve a foſſa in the inferior portion of the naſal proceſs, which, with the os unguis and os ſpongioſum inferius, forms a paſſage for the lachrymal duct.

Where theſe two bones are united to each other, they project ſomewhat upwards and forwards, leaving between them a furrow, into which the lower portion of the ſeptum naſi is admitted.

Each of theſe bones being hollow, a conſiderable ſinus is formed under its orbitar part. This cavity, which is uſually named after Highmore, though it was deſcribed by Fallopius and others before his time, is lined with the pituitary membrane. It is intended for the ſame purpoſes as the other ſinuſes of the noſe, and opens into the noſtrils.

The oſſa maxillaria are connected with the greater part of the bones of the face and cranium, and aſſiſt in forming not only the cheeks, but likewiſe the palate, noſe, and orbits.

21 Of the oſſa naſi. The oſſa naſi form two irregular ſquares. They are thicker and narrower above than below. Externally they are ſomewhat convex, and internally ſlightly concave. Theſe bones conſtitute the upper part of the noſe. At their fore part they are united to each other, above to the os frontis, by their ſides to the oſſa maxillaria ſuperiora, poſteriorly and interiorly to the ſeptum narium, and below to the cartilages that compoſe the reſt of the noſtrils.

22 Of the oſſa unguis. Theſe little tranſparent bones owe their name to their ſuppoſed reſemblance to a finger-nail. Sometimes they are called *oſſa lachrymalia*, from their concurring with the naſal proceſs of each maxillary bone in forming a lodgement for the lachrymal ſac and duct.

The oſſa unguis are of an irregular figure. Their external ſurface conſiſts of two ſmooth parts, divided by a middle ridge. One of theſe parts, which is concave and neareſt to the noſe, ſerves to ſupport the lachrymal ſac and part of the lachrymal duct. The other, which is flat, forms a ſmall part of the orbit.

Each of theſe bones is connected with the os frontis, os ethmoides, and os maxillare ſuperius.

23
Of the oſſa palati.

Theſe bones, which are ſituated at the back part of the roof of the mouth, between the os ſphenoides and the oſſa maxillaria ſuperiora, are of a very irregular ſhape, and ſerve to form the naſal and maxillary foſſa, and a ſmall portion of the orbit. Where they are united to each other, they riſe up into a ſpine on their internal ſurface. This ſpine appears to be a continuation of that of the ſuperior maxillary bones, and helps to form the ſeptum narium.

Theſe bones are joined to the oſſa maxillaria ſuperiora, os ethmoides, os ſphenoides, and vomer.

24
Of the vomer.

This bone derives its name from its reſemblance to a ploughſhare. It is a long and flat bone, ſomewhat thicker at its back than at its fore part. At its upper part we obſerve a furrow extending through its whole length. The poſterior and largeſt part of this furrow receives a proceſs of the ſphenoid bone. From this the furrow advances forwards, and becoming narrower and ſhallower, receives ſome part of the naſal lamella ethmoidea; the reſt ſerves to ſupport the middle cartilage of the noſe.

The inferior portion of this bone is placed on the naſal ſpine of the maxillary and palate bones, which we mentioned in our deſcription of the oſſa palati.

The vomer is united to the os ſphenoides, os ethmoides, oſſa maxillaria ſuperiora, and oſſa palati. It forms part of the ſeptum narium, by dividing the back part of the noſe into two noſtrils.

25
Of the oſſa ſpongioſa inferiora.

The parts which are uſually deſcribed by this name, do not ſeem to deſerve to be diſtinguiſhed as diſtinct bones, except in young ſubjects. They conſiſt of a ſpongy lamella in each noſtril, which is united to the ſpongy lamina of the ethmoid bone, of which they are by ſome conſidered as a part.

Each of theſe lamellæ is longeſt from behind forwards; with its convex ſurface turned towards the ſeptum narium, and its concave part towards the maxillary bone, covering the opening of the lachrymal duct into the noſe.

Theſe bones are covered with the pituitary membrane; and, beſides their connection with the ethmoid bone, are joined to the oſſa maxillaria ſuperiora, oſſa palati, and oſſa unguis.

26
Of the maxilla inferior.

The maxilla inferior, or lower jaw, which in its ſhape reſembles a horſe-ſhoe, conſiſts of two diſtinct bones in the fœtus; but theſe unite together ſoon after birth, ſo as to form only one bone. The upper edge of this bone, like the os maxillare ſuperius, has an alveolar proceſs, furniſhed with ſockets for the teeth.

On each ſide, the poſterior part of the bone riſes almoſt perpendicularly into two proceſſes. The higheſt of theſe, called the coronoid proceſs, is pointed and thin, and ſerves for the inſertion of the temporal muſcle. The other, or condyloid proceſs, as it is called, is ſhorter and thicker, and ends in an oblong rounded head, which is received into a foſſa of the temporal bone, and is formed for a moveable articulation with the cranium. This joint is furniſhed with a moveable cartilage. At the bottom of each coronoid proceſs, on its inner part, we obſerve a foramen extending under the roots of all the teeth, and terminating at the outer ſurface of the bone near the chin. Each of theſe canals tranſmits an artery, vein, and nerve, from which branches are ſent off to the teeth.

The lower jaw is capable of a great variety of motion. By ſliding the condyles from the cavity towards the eminences on each ſide, we bring it horizontally forwards, as in biting; or we may bring the condyles only forward, and tilt the reſt of the jaw backward, as in opening the mouth. We are likewiſe able to ſlide the condyles alternately backwards and forwards from the cavity to the eminence, and *vice verſa*, as in grinding the teeth. The cartilages, by adapting themſelves to the different inequalities in theſe ſeveral motions of the jaw, ſerve to ſecure the articulation, and to prevent any injuries from friction.

The alveolar proceſſes are compoſed of an outer and inner bony plate, united together by thin partitions, which at the fore part of the jaw divide the proceſſes into as many ſockets as there are teeth. But at the back part of the jaw, where the teeth have more than one root, we find a diſtinct cell for each root. In both jaws theſe proceſſes begin to be formed with the teeth; they likewiſe accompany them in their growth, and gradually diſappear when the teeth are removed.

§ 3. *Of the Teeth.*

27
Of the teeth.

The teeth are bones of a particular ſtructure, formed for the purpoſes of maſtication and the articulation of the voice. It will be neceſſary to conſider their compoſition and figure, their number and arrangement, and the time and order in which they appear.

In each tooth we may diſtinguiſh a body, a neck, and a root or fangs.

The body of the tooth is that part which appears above the gums. The root is fixed into the ſocket, and the neck is the middle part between the two.

The teeth are compoſed of two ſubſtances, viz. enamel and bone. The enamel, or the vitreous or cortical part of the tooth, is a white and very hard and compact ſubſtance peculiar to the teeth, and appears fibrous or ſtriated when broken. This ſubſtance is thickeſt on the grinding ſurface, and becoming gradually thinner, terminates inſenſibly at the neck of the tooth. Ruyſch [*] affirmed, that he could trace the arteries into the hardeſt part of the teeth; Liewenhoeck [†] ſuſpected the fibres of the enamel to be ſo many veſſels; and Monro [‡] ſays, he has frequently injected the veſſels of the teeth in children, ſo as to make the inſide of the cortex appear perfectly red. But it is certain, that it is not tinged by a madder diet, and that no injection will ever reach it, ſo that it has no appearance of being vaſcular [**].

The bony part, which compoſes the inner ſubſtance of the body, neck, and root of the tooth, reſembles other bones in its ſtructure, but it is much harder than the moſt compact part of bones in general. As a tooth when once formed receives no tinge from a madder diet, and as the minuteſt injections do not penetrate into its ſubſtance, this part of the tooth has, like the enamel, been ſuppoſed not to be vaſcular. But when we conſider that the fangs of a tooth are inveſted by a perioſteum, and that the ſwellings of theſe fangs are analogous to the ſwellings of other bones, we may reaſonably conclude, that there is a ſimiliarity of ſtructure; and that this bony part has a circulation through its ſubſtance, although from its hardneſs we are unable to demonſtrate its veſſels.

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[*] *Theſaur* 10. no. 27.

[†] *Arcan. Natur. continuat. Epiſtol.*

[‡] *Anat. of the Human Bones.*

[**] *Hunter on the Teeth.*

In each tooth we find an inner cavity, into which enter an artery, vein, and nerve. This cavity begins by a ſmall opening, and becoming larger, terminates in the body of the tooth. In advanced life this hole ſometimes cloſes, and the tooth is of courſe rendered inſenſible.

The perioſteum ſurrounds the teeth from their fangs to a little beyond their bony ſockets, where we find it adhering to the gums. This membrane, while it incloſes the teeth, ſerves at the ſame time to line the ſockets, ſo that it may be conſidered as common to both.

The teeth are likewiſe ſecured in their ſockets by means of the gums; a red, vaſcular, firm, and elaſtic ſubſtance, that poſſeſſes but little ſenſibility. In the gums of infants we find a hard ridge extending through their whole length, but no ſuch ridge is to be ſeen in old people who have loſt their teeth.

The number of the teeth in both jaws at full maturity, uſually varies from twenty-eight to thirty-two. They are commonly divided into three claſſes, viz. inciſores, canini, and grinders or molares (H). The inciſores are the four teeth in the fore part of each jaw. They have each of them two ſurfaces; one anterior and convex, the other poſterior and ſlightly concave, both of which terminate in a ſharp edge. They are called *inciſores* from their uſe in dividing the food. They are uſually broader and thicker in the upper than in the under jaw; and, by being placed ſomewhat obliquely, generally fall over the latter.

The canini derive their name from their reſemblance to a dog's tuſks, being the longeſt of all the teeth. We find one on each ſide of the inciſores, ſo that there are two canini in each jaw. Their fang reſembles that of the inciſores, but is much larger; and in their ſhape they appear like an inciſor with its edge worn off, ſo as to terminate in a narrow point.

Theſe teeth not being calculated for cutting and dividing the food like the inciſores, or for grinding it like the molares, ſeem to be intended for laying hold of ſubſtances (I).

The molares or grinders, of which there are ten in each jaw, are ſo called, becauſe from their ſhape and ſize they are fitted for grinding the food. Each of the inciſores and canini is furniſhed only with one fang; but in the molares of the under jaw we conſtantly find two fangs, and in thoſe of the upper jaw three fangs. Theſe fangs are ſometimes ſeparated into two points, and each of theſe points has ſometimes been deſcribed as a diſtinct fang.

The two firſt of the molares, or thoſe neareſt to the canine teeth on each ſide, differ from the other three, and are with great propriety named *bicuſpides* by Mr Hunter. They have ſometimes only one root, and ſeem to be of a middle nature between the inciſores and the larger molares. The two next are much larger. The fifth or laſt grinder on each ſide is ſmaller and ſhorter than the reſt; and from its not cutting the gum till after the age of twenty, and ſometimes not till much later in life, is called *dens ſapientiæ*.

There is in the ſtructure and arrangement of all theſe teeth an art which cannot be ſufficiently admired. To underſtand it properly, it will be neceſſary to conſider the under jaw as a kind of lever, with its fixed points at its articulations with the temporal bones:—it will be right to obſerve, too, that its powers ariſe from its different muſcles, but in elevation chiefly from the temporalis and maſſeter; and that the aliment conſtitutes the object of reſiſtance. It will appear, then, that the molares, by being placed neareſt the centre of motion, are calculated to preſs with a much greater force than the other teeth, independent of their grinding powers which they poſſeſs by means of the pterygoid muſcles; and that it is for this reaſon we put between them any hard body we wiſh to break.

The canini and inciſores are placed farther from this point, and of courſe cannot exert ſo much force; but they are made for cutting and tearing the food, and this form ſeems to make amends for their deficiency in ſtrength.

There are examples of children who have come into the world with two, three, and even four teeth; but theſe examples are very rare; and it is ſeldom before the ſeventh, eighth, or ninth month after birth, that the inciſores, which are the firſt formed, begin to paſs through the gum. The ſymptoms of dentition, however, in conſequence of irritation from the teeth, frequently take place in the fourth or fifth month.—About the twentieth or twenty-fourth month, the canini and two molares make their appearance.

The dangerous ſymptoms that ſometimes accompany dentition, are owing to the preſſure of the teeth on the gum, which they irritate ſo as to excite pain and inflammation. This irritation ſeems to occaſion a gradual waſting of the gum at the part, till at length the tooth makes its appearance.

The ſymptoms are more or leſs alarming, in proportion to the reſiſtance which the gum affords to the teeth, and according to the number of teeth which may chance to ſeek a paſſage at the ſame time. Were they all to appear at once, children would fall victims to the pain and exceſſive irritation; but Nature has ſo very wiſely diſpoſed them, that they uſually appear one after the other, with ſome diſtance of time between each. The firſt inciſor that appears is generally in the lower jaw, and is followed by one in the upper

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(H) Mr Hunter has thought proper to vary this diviſion. He retains the old name of *inciſores* to the four fore teeth, but he diſtinguiſhes the canine teeth by the name of the *cuſpidati*. The two teeth which are next to theſe, and which have been uſually ranked with the molares, he calls the *bicuſpides*; and he gives the name of *grinders* only to the three laſt teeth on each ſide.

(I) Mr Hunter remarks of theſe teeth, that we may trace in them a ſimiliarity in ſhape, ſituation, and uſe, from the moſt imperfectly carnivorous animal, which we believe to be the human ſpecies, to the lion, which is the moſt perfectly carnivorous.

per jaw. Sometimes the canini, but more commonly one of the molares, begins to paſs through the gum firſt.

Theſe 20 teeth, viz. eight inciſores, four canini, and eight molares, are called *temporary* or *milk teeth*, becauſe they are all ſhed between the age of ſeven and 14, and are ſucceeded by what are called the *permanent* or *adult teeth*. The latter are of a firmer texture, and have larger fangs.

Theſe adult teeth being placed in a diſtinct ſet of alveoli, the upper ſockets gradually diſappear, as the under ones increaſe in ſize, till at length the temporary, or upper teeth, having no longer any ſupport, conſequently fall out.

To theſe 20 teeth, which ſucceed the temporary ones, 12 others are afterwards added, viz. three molares on each ſide in both jaws: and in order to make room for this addition, we find that the jaws gradually lengthen in proportion to the growth of the teeth; ſo that with 20 teeth, they ſeem to be as completely filled as they are afterwards with 32. This is the reaſon why the face is rounder and flatter in children than in adults.

With regard to the formation of the teeth, we may obſerve, that in a fœtus of four months, the alveolar proceſs appears only as a ſhallow longitudinal groove, divided by minute ridges into a number of intermediate depreſſions; in each of which we find a ſmall pulpy ſubſtance, ſurrounded by a vaſcular membrane. This pulp gradually oſſifies, and its lower part is lengthened out to form the fang. When the bony part of the tooth is formed, its ſurface begins to be incruſted with the enamel. How the latter is formed and depoſited, we are not yet able to determine.

The rudiments of ſome of the adult teeth begin to be formed at a very early period, for the pulp of one of the inciſores may generally be perceived in a fœtus of eight months, and the oſſification begins in it ſoon after birth. The firſt bicuſpis begins to oſſifiy about the fifth or ſixth, and the ſecond about the ſeventh year. The firſt adult grinder cuts the gum about the 12th, the ſecond about the 18th, and the third, or *dens ſapientiæ*, uſually between the 20th and 30th year.

The teeth, like other bones, are liable to be affected by diſeaſe. Their removal is likewiſe the natural conſequences of old age; for as we advance in life, the alveoli fill up, and the teeth, eſpecially the inciſores, fall out. When this happens, the chin projects forward, and the face is much ſhortened.

§ 4. *Of the Os Hyoides.* (K)

28. The os hyoides, which is placed at the root of the tongue, was ſo called by the ancients on account of its ſuppoſed reſemblance to the Greek letter *υ*.

It will be neceſſary to diſtinguiſh in it, its body, horns, and appendices.

The body, which is the middle and broadeſt part of the bone, is ſo placed that it may be eaſily felt at the fore part of the throat. Anteriorly it is irregularly convex, and its inner ſurface is unequally concave. Its cornua, or horns, which are flat and a little bent, being much longer than the body part, may be deſcribed as forming the ſides of the *υ*. The appendices, or little horns, as they are called by M. Winſlow, and ſome other writers, are two proceſſes which riſe up from the articulations of the cornua with the body, and are uſually connected with the ſtyloid proceſs on each ſide by means of a ligament.

The uſes of this bone are to ſupport the tongue, and afford attachment to a great number of muſcles; ſome of which perform the motions of the tongue, while others act on the larynx and fauces.

Sect. III. *Of the Bones of the Trunk.*

The trunk of the ſkeleton conſiſts of the ſpine, the thorax, and the pelvis. 29.

§ 1. *Of the Spine.*

30. The ſpine is compoſed of a great number of bones called *vertrebæ*, forming a long bony column, in figure not much unlike the letter *ſ*. This column, which extends from the head to the lower part of the body, may be ſaid to conſiſt of two irregular and unequal pyramids, united to each other in that part of the loins where the laſt lumbar vertebra joins the os ſacrum.

The vertebræ of the upper and longeſt pyramid are called *true vertebræ*, in contradiſtinction to thoſe of the lowermoſt pyramid, which, from their being immoveable in the adult, are ſtyled *falſe vertebræ*. It is upon the bones of the ſpine that the body turns; and it is to this circumſtance they owe their name, which is derived from the Latin verb *vertere*, to return.

The true vertrebræ are divided into three claſſes of cervical, darſal, and lumbar vertebræ.—The falſe vertebræ conſiſt of the os ſacrum and os coccygis.

In each vertebra, as in other bones, it will be neceſſary to remark the body of the bone, its proceſſes, and cavities.

The body, which is convex before, and concave behind, where it aſſiſts in forming the cavity of the ſpine, may be compared to part of a cylinder cut off tranſverſely.

Each vertebra affords ſeven proceſſes. The firſt is at the back part of the vertebra, and from its ſhape and direction is named the *ſpinous proceſs*. On each ſide of this are two others, which, from their ſituation with reſpect to the ſpine, are called *tranſverſe proceſſes*. The four others are ſtyled *oblique* or *articular proceſſes*. They are much ſmaller than the ſpinous or tranſverſe ones. Two of them are placed on the upper, and two on the lower part of each vertebra, riſing from near the baſis of each tranſverſe proceſs. They have gotten the name of *oblique proceſſes*, from their ſituation with reſpect to the proceſſes with which they are articulated; and they are ſometimes ſtyled *articular proceſſes*, from the manner in which they are articulated with each other; the two ſuperior proceſſes of one vertebra being articulated with

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(K) This bone is very ſeldom preſerved with the ſkeleton, and cannot be included among the bones of the head, or any other diviſion of the ſkeleton. Thomas Bartholin has perhaps very properly deſcribed it among parts contained in the mouth; but the generality of anatomical writers have placed it, as it is here, after the bones of the face.

with the two inferior proceſſes of the vertebra above it. Each of theſe proceſſes is covered with cartilage at its articulation, and their articulations with each other are by a ſpecies of ginglimus.

In each vertebra, between its body and its proceſſes, we find a hole large enough to admit a finger. Theſe holes or foramina, correſpond with each other through all the vertebræ, and form the long bony channel in which the ſpinal marrow is placed. We may likewiſe obſerve four notches in each vertebra. Two of theſe notches are at the upper, and two at the lower part of the bone, between the oblique proceſſes and the body of the vertebra. Each of theſe notches meeting with a ſimilar opening in the vertebra above or below it, forms a foramen for the paſſage of blood-veſſels, and of the nerves out of the ſpine.

The bones of the ſpine are united together by means of a ſubſtance, which in young ſubjects appears to be of a ligamentous, but in adults more of a cartilaginous nature. This intervertebral ſubſtance, which forms a kind of partition between the ſeveral vertebræ, is thicker and more flexible between the lumbar vertebræ than in the other parts of the ſpine, the moſt conſiderable motions of the trunk being performed on thoſe vertebræ. This ſubſtance being very elaſtic, the extenſion and flexion of the body, and its motion backwards and forwards, or to either ſide, are performed with great facility. This elaſticity ſeems to be the reaſon why people who have been long ſtanding, or have carried a conſiderable weight, are found to be ſhorter than when they have been long in bed. In the two firſt inſtances the intervertebral cartilages (as they are uſually called) are evidently more expoſed to compreſſion than when we are in bed in an horrizontal poſture.

In advanced life theſe cartilages become ſhrivelled, and of courſe loſe much of their elaſticity. This may ſerve to account for the decreaſe in ſtature and the ſtooping forward which are uſually to be obſerved in old people.

Beſides the connection of the ſeveral vertebræ by means of this intervertebral ſubſtance, there are likewiſe many ſtrong ligaments, both external and internal, which unite the bones of the ſpine to each other. Their union is alſo ſtrengthened by a variety of ſtrong muſcles that cover and ſurround the ſpine.

The bones of the ſpine are found to diminiſh in denſity, and to be leſs firm in their texture in proportion as they increaſe in bulk; ſo that the lowermoſt vertebræ, though the largeſt, are not ſo heavy in proportion as the upper ones. By this means the ſize of theſe bones is increaſed without adding to their weight: a circumſtance of no little importance in a part like the ſpine, which, beſides flexibility and ſuppleneſs, ſeems to require lightneſs as one of its eſſential properties.

In very young children, each vertebra conſiſts of three bony pieces united by cartilages which afterwards oſſify.

31 ertebræ f the neck.

There are ſeven vertebræ of the neck—they are of a firmer texture than the other bones of the ſpine. Their tranſverſe proceſſes are forked for the lodgment of muſcles, and at the bottom of each we obſerve a foramen, through which paſs the cervical artery and vein. The firſt and ſecond of theſe vertebræ muſt be deſcribed more particularly. The firſt approaches almoſt to an oval ſhape—On its ſuperior ſurface it has two cavities which admit the condyles of the occipital bone with which it is articulated. This vertebra, which is called *atlas* from its ſupporting the head, cannot well be deſcribed as having either body or ſpinous proceſs, being a kind of bony ring. Anteriorly, where it is articulated to the odontoid proceſs of the ſecond vertebra, it is very thin. On its upper ſurface it has two cavities which admit the condyles of the occipital bone. By this connection the head is allowed to move forwards and backwards, but has very little motion in any other direction.

The ſecond vertebra has gotten the name of *dentata*, from its having, at its upper and anterior part, a proceſs called the *odontoid* or *tooth-like proceſs*, which is articulated with the atlas, to which this ſecond vertebra may be ſaid to ſerve as an axis. This odontoid proceſs is of a cylindrical ſhape, ſomewhat flattened, however, anteriorly and poſteriorly. At its fore-part where it is received by the atlas, we may obſerve a ſmooth, convex, articulating ſurface. It is by means of this articulation that the head performs its rotatory motion, the atlas in that caſe moving upon this odontoid proceſs as upon a pivot. But when this motion is in any conſiderable degree, or, in other words, when the head moves much either to the right or left, all the cervical vertebræ ſeem to aſſiſt, otherwiſe the ſpinal marrow would be in danger of being divided tranſverſely by the firſt vertebra.

32 Vertebræ of the back.

The ſpinous proceſs of each of the cervical vertebræ is ſhorter, and their articular proceſſes more oblique, than in the other bones of the ſpine.

Theſe 12 vertebræ are of a middle ſize between thoſe of the neck and loins. At their ſides we may obſerve two depreſſions, one at the upper and the other at the lower part of the body of each vertebræ; which uniting with ſimilar depreſſions in the vertebræ above and below, form articulating ſurfaces, covered with cartilages, for receiving the heads of the ribs; and at the fore-part of their tranſverſe proceſs (excepting the two laſt) we find an articulating ſurface for receiving the tuberoſity of the ribs.

33 Lumbar vertebræ

Theſe five vertebræ differ only from thoſe of the back in their being larger, and in having their ſpinous proceſſes at a greater diſtance from each other. The moſt conſiderable motions of the trunk are made on theſe vertebræ; and theſe motions could not be performed with ſo much eaſe, were the proceſſes placed nearer to each other.

34 Os ſacrum.

The os ſacrum, which is compoſed of five or ſix pieces in young ſubjects, becomes one bone in more advanced age.

It is nearly of a triangular figure, its inferior portion being bent a little forwards. Its ſuperior part has two oblique proceſſes which are articulated with the laſt of the lumbar vertebræ; and it has likewiſe commonly three ſmall ſpinous proceſſes, which gradually become ſhorter, ſo that the lowermoſt is not ſo long as the ſecond, nor the ſecond as the uppermoſt. Its tranſverſe proceſſes are formed into one oblong proceſs, which becomes gradually ſmaller as it deſcends. Its concave or anterior ſide is uſually ſmooth, but its poſterior convex ſide has many prominences (the moſt remarkable of which are the ſpinous proceſſes juſt now mentioned), which are filled up and covered with the muſcular and tendinous parts behind.

This bone has five pair of holes, which afford a paſſage to blood-veſſels, and likewiſe to the nerves that are derived from the ſpinal marrow, which is continued even here, being lodged in a triangular cavity, that becomes ſmaller as it deſcends, and at length terminates obliquely at the lower part of this bone. Below the third diviſion of the os ſacrum, this canal is not completely bony as in the reſt of the ſpine, being ſecured at its back part only by a very ſtrong membrane, ſo that a wound at this part muſt be extremely dangerous.

The os ſacrum is united laterally to the oſſa innominata or hip-bones, and below to the coccyx.

35 Os coccyx. The coccyx, which, like the os ſacrum, is in young people made up of three or four diſtinct parts, uſually becomes one bone in the adult ſtate.

It ſerves to ſupport the inteſtinum rectum; and, by its being capable of ſome degree of motion at its articulation with the ſacrum, and being like that bone bent forwards, we are enabled to ſit with eaſe.

This bone is nearly of a triangular ſhape, being broadeſt at its upper part, and from thence growing narrower to its apex, where it is not bigger than the little finger.

It has got its name from its ſuppoſed reſemblance to a cuckow's beak. It differs greatly from the vertebræ, being commonly without any proceſſes, and having no cavity for the ſpinal marrow, or foramina for the tranſmiſſion of nerves.

The ſpine, of which we have now finiſhed the anatomical deſcription, is deſtined for many great and important uſes. The medulla ſpinalis is lodged in its bony canal ſecure from external injury. It ſerves as a defence to the abdominal and thoracic viſcera, and at the ſame time ſupports the head, and gives a general firmneſs to the whole trunk.

We have before compared it to the letter *ſ*, and its different turns will be found to render it not very unlike the figure of that letter.—In the neck we ſee it projecting ſomewhat forward to ſupport the head, which without this aſſiſtance would require a great number of muſcles.—Lower down, in the thorax, we find it taking a curved direction backwards, and of courſe increaſing the cavity of the cheſt. After this, in the loins, it again projects forwards in a direction with the centre of gravity, by which means we are eaſily enabled to keep the body in an erect poſture, for otherwiſe we ſhould be liable to fall forward. Towards its inferior extremity, however, it again recedes backward, and thus aſſiſts in forming the pelvis, the name given to the cavity in which the urinary bladder, inteſtinum rectum, and other viſcera are placed.

If this bony column had been formed only of one piece, it would have been much more eaſily fractured than it is now: and by confining the trunk to a ſtiff ſituation, a variety of motions would have been altogether prevented, which are now performed with eaſe by the great number of bones of which it is compoſed.

It is firm, and yet to this firmneſs there is added a perfect flexibility. If it be required to carry a load upon the head, the neck becomes ſtiff with the aſſiſtance of its muſcles, and accommodates itſelf to the load, as if it was compoſed only of one bone.—In ſtooping likewiſe, or in turning to either ſide, the ſpine turns itſelf in every direction, as if all its bones were ſeparated from each other.

In a part of the body, like the ſpine, that is made up of ſo great a number of bones, and intended for ſuch a variety of motion, there muſt be a greater danger of diſlocation than fracture; but we ſhall find, that this is very wiſely guarded againſt in every direction by the proceſſes belonging to each vertebra, and by the ligaments, cartilages, &c. by which theſe bones are connected with each other.

§ 2. *Of the Bones of the Thorax.* 36

The thorax, or cheſt, is compoſed of many bones, *viz.* the ſternum which is placed at its anterior part, twelve ribs on each ſide which make up its lateral parts, and the dorſal vertebræ which conſtitute its poſterior part. Theſe laſt have been already deſcribed.

37 Of the ſternum. The ſternum is the long bone which extends itſelf from the upper to the lower part of the breaſt anteriorly, and to which the ribs and the clavicles are articulated.

In children it is compoſed of ſeveral bones united by cartilages; but as we advance in life, moſt of theſe cartilages oſſify, and the ſternum in the adult ſtate is found to conſiſt only of three pieces, and ſometimes become one bone. It is however generally deſcribed as being compoſed of three parts—one ſuperior, which is broad, thick, and ſhort; and one in the middle, which is thinner, narrower, and longer than the other.

It terminates at its lower part by a third piece, which is called the *xyphoid*, or *ſword-like cartilage*, from its ſuppoſed reſemblance to the blade of a ſword, and becauſe in young ſubjects it is commonly in a cartilaginous ſtate.

We have already obſerved, that this bone is articulated with the clavicle on each ſide. It is likewiſe joined to the fourteen true ribs, *viz.* ſeven on its right and ſeven on its left ſide.

38 Of the ribs. The ribs are bones ſhaped like a bow, forming the ſides of the cheſt. There are twelve on each ſide. They are diſtinguiſhed into true and falſe ribs: The ſeven upper ribs which are articulated to the ſternum are called *true ribs*, and the five lower ones that are not immediately attached to that bone are called *falſe ribs*.

On the inferior and interior ſurface of each rib, we obſerve a ſinuoſity for the lodgment of an artery, vein, and nerve.

The ribs are not bony through their whole length, their anterior part being cartilaginous. They are articulated with the vertebræ and ſternum. Every rib (or at leaſt the greater number of them) has at its poſterior part two proceſſes; one at its extremity called the head of the rib, by means of which it is articulated with the body of two vertebræ; and another, called its tuberoſity, by which it is articulated with the tranſverſe proceſs of the loweſt of theſe two vertebræ. The firſt rib is not articulated by its extremity to two vertebræ, being ſimply attached to the upper part of the firſt vertebra of the back. The ſeven ſuperior or true ribs are articulated anteriorly with the ſternum by their cartilages; but the falſe ribs are ſupported in a different manner—the eighth, which is the firſt of theſe ribs, being attached by its cartilage to the ſeventh; the ninth to the eighth, &c.

The two lowermoſt ribs differ likewiſe from all the reſt in the following particulars: They are articulated only with the body of the vertebra, and not with a tranſverſe proceſs; and anteriorly, their cartilage is looſe, not being attached to the cartilages of the other ribs; and this ſeems to be, becauſe the moſt conſiderable motions of the trunk are not performed on the lumbar vertebræ alone, but likewiſe on the two laſt vertebræ of the back; ſo that if theſe two ribs had been confined at the fore part like the other ribs, and had been likewiſe articulated with the bodies of two vertebræ, and with the tranſverſe proceſſes, the motion of the two laſt vertebræ, and conſequently of the whole trunk, would have been impeded.

The ribs help to form the cavity of the thorax; they afford attachment to different muſcles; they are uſeful in reſpiration; and they ſerve as a ſecurity to the heart and lungs.

39.

§ 3. *Of the Bones of the Pelvis.*

The pelvis is compoſed of the os ſacrum, os coccygis, and two oſſa innominata. The two firſt of theſe bones were included in the account of the ſpine, to which they more properly belong.

In children, each os innominatum is compoſed of three diſtinct bones; but as we advance in life the intermediate cartilages gradually oſſify, and the marks of the original ſeparation diſappear, ſo that they become one irregular bone; ſtill however continuing to retain the names of ilium, iſchium, and pubis, by which their diviſions were originally diſtinguiſhed, and to be deſcribed as three different bones by the generality of anatomiſts. The os ilium forms the upper and moſt conſiderable part of the bone, the os iſchium its lower and poſterior portion, and the os pubis its fore part. 40

Os ilium. The os ilium or haunch bone, is articulated poſteriorly to the os ſacrum by a firm cartilaginous ſubſtance, and is united to the os pubis before and to the os iſchium below. Its ſuperior portion is thin, and terminates in a ridge called the criſta or ſpine of the ilium, and more commonly known by the name of the haunch. This chriſta riſes up like an arch; being turned ſomewhat outwards, ſo as to reſemble the wings of a phaeton.

Externally this bone is unequally prominent and hollowed for the lodgement of muſcles; internally we find it ſmooth and concave. At its lower part there is a conſiderable ridge on its inner ſurface. This ridge extends from the os ſacrum, and correſponds with a ſimilar prominence both on that bone and the iſchium; forms with the inner part of the oſſa pubis what in midwifery is termed the brim of the pelvis.

The criſta, or ſpine, which at firſt is an epiphyſis, has two conſiderable tuberoſities; one anteriorly, and the other poſteriorly, which is the largeſt of the two: Theſe, from their projecting more than the parts of the bone below them, have gotten the name of ſpinal proceſſes. From the anterior ſpinous proceſs, the ſartorius and tenſor vagina femoris muſcles have their origin; and below the poſterior proceſs we obſerve a conſiderable niche in the bone, which, in the recent ſubject, is formed into a large foramen, by means of a ſtrong ligament that is ſtretched over its lower part from the os ſacrum to the ſharp-pointed proceſs of the iſchium. This hole affords a paſſage to the great ſciatic nerve, and to the poſterior crural veſſels under the pyriform muſcle, part of which likewiſe paſſes out here. 41

Os iſchium. The os iſchium, or hip-bone, which is of a very irregular figure, conſtitutes the lower lateral parts of the pelvis, and is commonly divided into its body, tuberoſity, and ramus. The body forms the lower and moſt conſiderable portion of the acetabulum, and ſends a ſharp-pointed proceſs backwards, called the ſpine of the iſchium. To this proceſs the ligament adheres, which was juſt now ſpoken of, as forming a foramen for the paſſage of the ſciatic nerve.—The tuberoſity, which is the loweſt part of the trunk, and ſupports us when we ſit, is large and irregular, affording origin to ſeveral muſcles. From this tuberoſity we find the bone becoming thinner and narrower. This part, which has the name of ramus or branch, paſſes forwards and upwards, and concurs with the ramus of the os pubis, to form a large hole called the *foramen magnum iſchii*, or *thyroideum*, as it is ſometimes named, from its reſemblance to a door or ſhield. This hole, which in the recent ſubject is cloſed by a ſtrong membrane called the obturator ligament, affords through its whole circumference attachment to muſcles. At its upper part where we obſerve a niche in the bone, it gives paſſage to the obturator veſſels and nerves, which go to the inner part of the thigh. Nature ſeems every where to avoid an unneceſſary weight of bone, and this foramen, no doubt, ſerves to lighten the bones of the pelvis. 42

Os pubis. The os pubis or ſhare-bone, which with its fellow forms the fore-part of the pelvis, is the ſmalleſt diviſion of the os innominatum. It is united to its fellow by means of a ſtrong cartilage, which forms what is called the ſymphyſis pubis.

In each os pubis we may diſtinguiſh the body of the bone, its angle, and ramus. The body or outer part is united to the os ilium. The angle comes forward to form the ſymphyſis, and the ramus is a thin proceſs which unites with the ramus of the iſchium, to form the foramen thyroideum.

The three bones we have deſcribed as compoſing each os innominatum, all aſſiſt in forming the acetabulum, in which the head of the os femoris is received. This cavity is every where lined with a ſmooth cartilage, excepting at its inner part, where we may obſerve a little foſſa, in which are lodged the mucilaginous glands of the joint. We may likewiſe notice the pit or depreſſion made by the round ligament, as it is improperly called, which, by adhering to this cavity and to the head of the thigh-bone, helps to ſecure the latter in the ſocket.

Theſe bones, which are united to each other and to the ſpine by many very ſtrong ligaments, ſerve to ſupport the trunk, and to connect it with the lower extremities; and at the ſame time to form the pelvis or baſon, in which are lodged the inteſtines and urinary bladder, and in women the uterus; ſo that the ſtudy of this part of oſteology is of the utmoſt importance in midwifery.

It is worthy of obſervation, that in women the os ſacrum is uſually ſhorter, broader, and more hollowed, the oſſa ilia more expanded, and the inferior opening of the pelvis larger than in men.

Sect. IV. *Of the Extremities.*

43. These parts of the ſkeleton conſiſt of the upper extremity and the lower.

§ 1. *Of the* Upper Extremity.

44. This conſiſts of the ſhoulder, the arm, and the hand.

1. Of the Shoulder.

45. The ſhoulder conſiſts of two bones, the clavicula and the ſcapula.

46 Of the clavicula. The former, which is ſo named from its reſemblance to the key in uſe amongſt the ancients, is a little curved at both its extremities like an italic *ſ*. It is likewiſe called *jugulum*, or collar-bone, from its ſituation. It is about the ſize of the little finger, but longer, and being of a very ſpongy ſubſtance is very liable to be fractured. In this, as in other long bones, we may diſtinguiſh a body and two extremities. The body is rather flattened than rounded. The anterior extremity is formed into a ſlightly convex head, which is nearly of a triangular ſhape. The inferior ſurface of the head is articulated with the ſternum. The poſterior extremity, which is flatter and broader than the other, is connected to a proceſs of the ſcapula, called *acromion*. Both theſe articulations are ſecured by ligaments, and in that with the ſternum we meet with a moveable cartilage, to prevent any injury from friction.

The clavicle ſerves to regulate the motions of the ſcapula, by preventing it from being brought too much forwards, or carried too far backwards. It affords origin to ſeveral muſcles, and helps to cover and protect the ſubclavian veſſels, which derive their name from their ſituation under this bone.

47 Of the ſcapula. The ſcapula, or ſhoulder-blade, which is nearly of a triangular ſhape, is fixed to the poſterior part of the true ribs, ſomewhat in the manner of a buckler. It is of a very unequal thickneſs, and, like all other broad, flat bones, is ſomewhat cellular. Exteriorly it is convex, and interiorly concave, to accommodate itſelf to the convexity of the ribs. We obſerve in this bone three unequal ſides, which are thicker and ſtronger than the body of the bone, and are therefore termed its *coſtæ*. The largeſt of the three, called alſo the baſis, is turned towards the vertebræ. Another, which is leſs than the former, is below this; and the third, which is the leaſt of the three, is at the upper part of the bone. Externally the bone is elevated into a conſiderable ſpine, which riſing ſmall at the baſis of the ſcapula, becomes gradually higher and broader, and divides the outer ſurface of the bone into two foſſæ. The ſuperior of theſe, which is the ſmalleſt, ſerves to lodge the ſupra ſpinatus muſcle; and the inferior foſſa, which is much larger than the other, gives origin to the infra ſpinatus. This ſpine terminates in a broad and flat proceſs at the top of the ſhoulder, called the *proceſſus acromion*, to which the clavicle is articulated. This proceſs is hollowed at its lower part to allow a paſſage to the ſupra and infra ſpinati muſcles. The ſcapula has likewiſe another conſiderable proceſs at its upper part, which, from its reſemblance to the beak of a bird, is called the *coracoid proceſs*. From the outer ſide of this coracoid proceſs, a ſtrong ligament paſſes to the proceſſus acromion, which prevents a luxation of the os humeri upwards. A third proceſs begins by a narrow neck, and ends in a cavity called *glenoid*, for the connection of the os humeri.

The ſcapula is articulated with the clavicle and os humeri, to which laſt it ſerves as a fulcrum; and by varying its poſition it affords a greater ſcope to the bones of the arm in their different motions. It likewiſe gives origin to ſeveral muſcles, and poſteriorly ſerves as a defence to the trunk.

2. Bones of the Arm.

48. The arm is commonly divided into two parts, which are articulated to each other at the elbow. The upper part retains the name of arm, properly ſo called, and the lower part is uſually called the fore arm.

49. The arm is compoſed of a ſingle bone called *os humeri*. This bone, which is almoſt of a cylindrical ſhape, may be divided into its body and its extremities.

The upper extremity begins by a large, round ſmooth head, which is admitted into the glenoid cavity of the ſcapula. On the upper and fore part of the bone there is a groove for lodging the long head of the biceps muſcle of the arm; and on each ſide of the groove, at the upper end of the bone, there is a tubercle to which the ſpinata muſcles are fixed.

The lower extremity has ſeveral proceſſes and cavities. The principal proceſſes are its two condyles, one exterior and the other interior, and of theſe the laſt is the largeſt. Between theſe two we obſerve two lateral protuberances, which, together with a middle cavity, form as it were a kind of pully upon which the motions of the fore-arm are chiefly performed. At each ſide of the condyles, as well exteriorly as interiorly, there is another eminence which gives origin to ſeveral muſcles of the hand and fingers. Poſteriorly and ſuperiorly, ſpeaking with reſpect to the condyles, we obſerve a deep foſſa which receives a conſiderable proceſs of the ulna; and anteriorly and oppoſite to this foſſa, we obſerve another, which is much leſs and receives another proceſs of the ſame bone.

The body of the bone has at its upper and anterior part a furrow which begins from behind the head of the bone, and ſerves to lodge the tendon of a muſcle. The body of the os humeri is hollow through its whole length, and, like all other long bones, has its marrow.

This bone is articulated at its upper part to the ſcapula. This articulation, which allows motion every way, is ſurrounded by a capſular ligament; that is ſometimes torn in luxation, and becomes an obſtacle to the eaſy reduction of the bone. Its lower extremity is articulated with the bones of the fore-arm.

50 Of the fore-arm. The fore-arm is compoſed of of two bones, the ulna and radius.

51 Of the ulna. The ulna or elbow-bone is much leſs than the os humeri, and becomes gradually ſmaller as it deſcends to the wriſt. At its upper part it has two proceſſes and two cavities. Of the two proceſſes, the largeſt, which is ſituated poſteriorly, and called the *olecranon*, is admitted into the poſterior foſſa of the os humeri. The other proceſs is placed anteriorly, and is called the *coronoid proceſs*. In bending the arm it enters into the anterior foſſa of the os humeri. This proceſs

being much ſmaller than the other, permits the fore-arm to bend inwards; whereas the olecranon, which is ſhaped like a hook, reaches the bottom of its foſſa in the os humeri as ſoon as the arm becomes ſtraight, and will not permit the fore-arm to be bent backwards. The ligaments likewiſe oppoſe this motion.

Between the two proceſſes we have deſcribed, there is a conſiderable cavity called the ſygmoid cavity, divided into two foſſæ by a ſmall eminence, which paſſes from one proceſs to the other; it is by means of this cavity and the two proceſſes, that the ulna is articulated with the os humeri by ginglimus.

At the bottom of the coronoid proceſs interiorly, there is a ſmall ſygmoid cavity, which ſerves for the articulation of the ulna with the radius.

The body of the ulna is of a triangular ſhape: Its lower extremity terminates by a ſmall head and a little ſtyloid proceſs. The ulna is articulated above to the os humeri—both above and below to the radius, and to the wriſt at its lower extremity. All theſe articulations are ſecured by means of ligaments. The chief uſe of this bone ſeems to be to ſupport and regulate the motions of the radius.

52 Of the radius. The radius, which is ſo named from its ſuppoſed reſemblance to the ſpoke of a wheel, is placed at the inſide of the fore-arm. It is ſomewhat larger than the ulna, but not quite ſo long as that bone. Its upper part is cylindrical, hollowed ſuperiorly to receive the outer condyle of the os humeri. Laterally it is admitted into the little ſygmoid cavity of the ulna, and the cylindrical part of the bone turns in this cavity in the motions of pronation and ſupination (1). This bone follows the ulna in flexion and extenſion, and may likewiſe be moved round its axis in any direction. The lower extremity of the radius is much larger and ſtronger than its upper part; the ulna, on the contrary, is ſmaller and weaker below than above; ſo that they ſerve to ſupply each others deficiencies in both thoſe parts.

On the external ſide of this bone, we obſerve a ſmall cavity which is deſtined to receive the lower end of the ulna; and its lower extremity is formed into a large cavity, by means of which it is articulated with the bones of the wriſt, and on this account it is ſometimes called *manubrium manus*. It ſupports the two firſt bones of the wriſt on the ſide of the thumb, whereas the ulna is articulated with that bone of the wriſt which correſponds with the little finger.

Through the whole length both of this bone and the ulna, a ridge is obſerved, which affords attachment to an interoſſeous ligament. This ligament fills up the ſpace between the two bones.

53

3. Bones of the Hand.

54 Of the carpus. The carpus or wriſt conſiſts of eight ſmall bones of an irregular ſhape, and diſpoſed in two unequal rows. Thoſe of the upper row are articulated with the bones of the fore-arm, and thoſe of the lower one with the metacarpus.

The ancient anatomiſts deſcribed theſe bones numerically; Lyſerus ſeems to have been the firſt who gave to each of them a particular name. The names he adopted are founded on the figure of the bones, and are now pretty generally received, except the firſt, which inſtead of κοτυλοειδες (the name given to it by Lyſerus, on account of its ſinus that admits a part of the os magnum), has by later writers been named *Scaphoides* or *Naviculare*. This, which is the outermoſt of the upper row (conſidering the thumb as the outer ſide of the hand), is articulated with the radius; on its inner ſide it is connected with the os lunare, and below to the trapezium and trapezoides. Next to this is a ſmaller bone, called the *os lunare*: becauſe its outer ſide, which is connected with the ſcaphoides, is ſhaped like a creſcent. This is likewiſe articulated with the radius. On its inner ſide it joins the os cuneiforme, and anteriorly, the os magnum and os unciforme.

The os cuneiform, which is the third bone in the upper row, is compared to a wedge, from its being broader above, at the back of the hand, than it is below. Poſteriorly it is articulated with the ulna, and anteriorly with the os unciforme.

Theſe three bones form an oblong articulating ſurface, covered by cartilage, by which the hand is connected with the fore-arm.

The os piſiforme, or pea-like bone, which is ſmaller than the three juſt now deſcribed, though generally claſſed with the bones of the upper row, does not properly belong to either ſeries, being placed on the under ſurface of the os cuneiforme, ſo as to project into the palm of the hand. The four bones of the ſecond row correſpond with the bones of the thumb and fingers; the firſt, ſecond, and fourth, are from their ſhapes named *trapezium*, *trapezoides*, and *unciforme*; the third, from its being the largeſt bone of the carpus, is ſtyled *os magnum*.

All theſe bones are convex towards the back, and ſlightly concave towards the palm of the hand; their articulating ſurfaces are covered with cartilages, and ſecured by many ſtrong ligaments, particularly by two ligamentous expanſions, called the external and internal annular ligaments of the wriſt. The former extends in an oblique direction from the os piſiforme to the ſtyloid proceſs of the radius, and is an inch and an half in breadth; the latter or internal annular ligament is ſtretched from the os piſiforme and os unciforme, to the os ſcaphoides and trapezium. Theſe annular ligaments likewiſe ſerve to bind down the tendons of the wriſt and fingers.

The metacarpus conſiſts of four bones, which ſupport the fingers; externally they are a little convex, 55 Of the metacarpus. and internally ſomewhat concave, where they form the palm of the hand. They are hollow, and of a cylindrical ſhape.

At each extremity they are a little hollowed for their articulation; ſuperiorly with the bones of the carpus, and inferiorly with the firſt phalanx of the fingers, in the ſame manner as the ſeveral phalanges of the fingers are articulated with each other.

The five fingers of each hand are compoſed of fifteen 56 Of the fingers. bones, diſpoſed in three ranks called phalanges: The bones of the firſt phalanx, which are articulated with the

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(1) The motions of pronation and ſupination may be eaſily deſcribed. If the palm of the hand, for inſtance, is placed on the ſurface of a table, the hand may be ſaid to be in a ſtate of pronation; but if the back part of the hand is turned towards the table, the hand will be then in a ſtate of ſupination.

the metacarpus, are the largeſt, and thoſe of the laſt phalanx the ſmalleſt. All theſe bones are larger at their extremities than in their middle part.

We obſerve at the extremities of the bones of the carpus, metacarpus, and fingers, ſeveral inequalities that ſerve for their articulation with each other; and theſe articulations are ſtrengthened by means of the ligaments which ſurround them.

It will be eaſily underſtood that this multiplicity of bones in the hand (for there are 27 in each hand) is eſſential to the different motions we wiſh to perform. If each finger was compoſed only of one bone inſtead of three, it would be impoſſible for us to graſp any thing.

57

§ 2. *Of the* LOWER EXTREMITIES.

Each lower extremity is divided into four parts, viz. the os femoris, or thigh bone: the rotula, or knee-pan; the leg and the foot.

1. Of the Thigh.

58 Of the os femoris. The thigh is compoſed only of this bone, which is the largeſt and ſtrongeſt we have. It will be neceſſary to diſtinguiſh its body and extremities: Its body, which is of a cylindrical ſhape, is convex before and concave behind, where it ſerves to lodge ſeveral muſcles.

Throughout two-thirds of its length we obſerve a ridge called *linea aſpera*, which originates from the trochanters, and after running for ſome way downwards, divides into two branches, that terminate in the tuberoſities at the lower extremity of the bone.

At its upper extremity we muſt deſcribe the neck and ſmooth head of the bone, and likewiſe two conſiderable proceſſes: The head, which forms the greater portion of a ſphere unequally divided, is turned inwards, and received into the great cotyloid cavity of the os innominatum. At this part of the bone there is a little foſſa to be obſerved, to which the round ligament is attached, and which we have already deſcribed as tending to ſecure the head of this bone in the great acetabulum. The neck is almoſt horizontal, conſidered with reſpect to its ſituation with the body of the bone. Of the two proceſſes, the external one, which is the largeſt, is called trochanter major; and the other, which is placed on the inſide of the bone, trochanter minor. They both afford attachment to muſcles. The articulation of the os femoris with the trunk is ſtrengthened by means of a capſular ligament, which adheres every where round the edge of the great cotyloid cavity of the os innominatum, and ſurrounds the head of the bone.

The os femoris moves upon the trunk in every direction.

At the lower extremity of the bone are two proceſſes called the condyles, and an intermediate ſmooth cavity, by means of which it is articulated with the leg by ginglimus.

All round the under end of the bone there is an irregular ſurface where the capſular ligament of the joint has its origin, and where blood-veſſels go into the ſubſtance of the bone.

Between the condyles there is a cavity poſteriorly, in which the blood-veſſels and nerves are placed, ſecure from the compreſſion to which they would otherwiſe be expoſed in the action of bending the leg, and which would not fail to be hurtful.

At the ſide of each condyle externally, there is a tuberoſity, from whence the lateral ligaments originate, which are extended down to the tibia.

A ligament likewiſe ariſes from each condyle poſteriorly. One of theſe ligaments paſſes from the right to the left, and the other from the left to the right, ſo that they interſect each other, and for that reaſon are called the *croſs ligaments*.

The lateral ligaments prevent the motion of the leg upon the thigh to the right or left; and the croſs ligaments, which are alſo attached to the tibia, prevent the latter from being brought forwards.

In new-born children all the proceſſes of this bone are cartilaginous.

2. The Rotula, or Knee-pan.

The rotula, patella, or knee-pan, as it is differently called, is a flat bone about four or five inches in circumference, and is placed at the fore-part of the joint of the knee. In its ſhape it is ſomewhat like the common figure of the heart, with its point downwards. 59 Of the rotula.

It is thinner at its edge than in its middle part; at its fore-part it is ſmooth and ſomewhat convex; its poſterior ſurface, which is more unequal, affords an elevation in the middle which is admitted between the two condyles of the os femoris.

This bone is retained in its proper ſituation by a ſtrong ligament which every where ſurrounds it, and adheres both to the tibia and os femoris; it is likewiſe firmly connected with the tibia by means of a ſtrong tendinous ligament of an inch in breadth, and upwards of two inches in length, which adheres to the lower part of the patella, and to the tuberoſity at the upper end of the tibia. On account of this connection, it is very properly conſidered as an appendage to the tibia, which it follows in all its motions, ſo as to be to it what the olecranon is to the ulna. There is this difference, however, that the olecranon is a fixed proceſs; whereas the patella is moveable, being capable of ſliding from above downwards and from below upwards. This mobility is eſſential to the rotatory motion of the leg.

In very young children this bone is entirely cartilaginous.

The principal uſe of the patella ſeems to be to defend the articulation of the knee from external injury; it likewiſe tends to increaſe the power of the extenſor muſcles of the leg, by removing their direction farther from the centre of motion in the manner of a pulley.

3. Of the Leg.

60 The leg is compoſed of two bones: Of theſe the inner one, which is the largeſt, is called tibia; the other is much ſmaller, and named fibula.

61 Of the tibia. The tibia, which is ſo called from its reſemblance to the muſical pipe of the ancients, has three ſurfaces, and is not very unlike a triangular priſm. Its poſterior ſurface is the broadeſt; anteriorly it has a conſiderable ridge called the ſhin, between which and the ſkin there are no muſcles. At the upper extremity of this bone are two ſurfaces, a little concave, and ſeparated from each other by an an intermediate elevation. The two little cavities receive the condyles of the os femoris, and the eminence between them is admitted into the cavity which we ſpoke of as being between the two condyles; ſo that this articulation affords a ſpecimen of the com-

plete ginglimus. Under the external edge of the upper end of this bone is a circular flat ſurface, which receives the head of the fibula.

At the lower and inner portion of the tibia, we obſerve a conſiderable proceſs called *malleolus internus.* The baſis of the bone terminates in a large tranverſe cavity, by which it is articulated with the uppermoſt bone of the foot. It has likewiſe another cavity at its lower end and outer ſide, which is ſomewhat oblong, and receives the lower end of the fibula.

The tibia is hollow through its whole length.

62 Of the fibula. The fibula is a ſmall long bone ſituated on the outſide of the tibia. Its ſuperior extremity does not reach quite ſo high as the upper part of the tibia, but its lower end deſcends ſomewhat lower. Both above and below, it is articulated with the tibia by means of the lateral cavities we noticed in our deſcription of that bone.

Its lower extremity is ſtretched out into a coronoid proceſs, which is flattened at its inſide, and is convex externally, forming what is called the *malleolus externus*, or *outer ancle.* This is rather lower than the malleolus internus of the tibia.

The body of this bone, which is irregularly triangular, is a little hollow at its internal ſurface, which is turned towards the tibia; and it affords like that bone, through its whole length, attachment to a ligament, which from its ſituation is called the interoſſeous ligament.

4. Of the Foot.

63 The foot conſiſts of the tarſus, metatarſus, and toes.

64 Of the tarſus. The tarſus is compoſed of ſeven bones, viz. the aſtragalus, os calcis, os naviculare, os cuboides, and three others called cuneiform bones.

65 Of the aſtragalus. The aſtragalus is a large bone with which both the tibia and fibula are articulated. It is the uppermoſt bone of the foot; it has ſeveral ſurfaces to be conſidered; its upper, and ſomewhat poſterior part, which is ſmooth and convex, is admitted into the cavity of the tibia. Its lateral parts are connected with the malleoli of the two bones of the leg; below, it is articulated with the os calcis, and its anterior ſurface is received by the os naviculare. All theſe articulations are ſecured by means of ligaments.

66 Of the os calcis. The os calcis, or calcaneum, which is of a very irregular figure, is the largeſt bone of the foot. Behind, it is formed into a conſiderable tuberoſity called the heel; without this tuberoſity, which ſupports us in an erect poſture, and when we walk, we ſhould be liable to fall backwards.

On the internal ſurface of this bone, we obſerve a conſiderable ſinuoſity, which affords a paſſage to the tendon of a muſcle: and to the poſterior part of the os calcis, a ſtrong tendinous cord called *tendo achillis* (M) is attached, which is formed by the tendons of ſeveral muſcles united together. The articulation of this with the other bones is ſecured by means of ligaments.

67 Of the os naviculare. The os naviculare, or ſcaphoides, (for theſe two terms have the ſame ſignification), is ſo called on account of its reſemblance to a little bark. At its poſterior part, which is concave, it receives the aſtragalus; anteriorly it is articulated with the cuneiform bones, and laterally is is connected with the os cuboides.

68 Of the os cuboides. The os cuboides forms an irregular cube. Poſteriorly it is articulated with the os calcis; anteriorly it ſupports the two laſt bones of the metatarſus, and laterally it joins the third cuneiform bone and the os naviculare.

69 Of the oſſa cuneiformia. Each of the oſſa cuneiformia, which are three in number, reſembles a wedge, and from this ſimilitude their name is derived. They are placed next to the metatarſus by the ſides of each other, and are uſually diſtinguiſhed into *os cuneiforme externum, medium* or *minimum*, and *internum* or *maximum.* The ſuperior ſurface of theſe bones, from their wedge-like ſhape, is broader than that which is below, where they help to form the ſole of the foot; poſteriorly they are united to the os naviculare, and anteriorly they ſupport the three firſt metatarſal bones.

When theſe ſeven bones compoſing the tarſus are viewed together in the ſkeleton, they appear convex above, where they help to form the upper part of the foot; and concave underneath, where they form the hollow of the foot, in which the veſſels, tendons, and nerves of the foot are placed ſecure from preſſure.

They are united to each other by very ſtrong ligaments, and their articulation with the foot is ſecured by a capſular and two lateral ligaments; each of the latter is covered by an annular ligament of conſiderable breadth and thickneſs, which ſerves to bind down the tendons of the foot, and at the ſame time to ſtrengthen the articulation.

The os cuneiforme externum is joined laterally to the os cuboides.

Theſe bones complete our account of the tarſus. Though what we have ſaid of this part of the oſteology has been very ſimple and conciſe, yet many readers may not clearly underſtand it: but if they will be pleaſed to view theſe bones in their proper ſituation in the ſkeleton, all that we have ſaid of them will be eaſily underſtood.

70 Of the metatarſus. The metatarſus is made up of five bones, whereas the metacarpus conſiſts only of four. The cauſe of this difference is, that in the hand the laſt bone of the thumb is not included among the metacarpal bones; whereas in the foot the great toe has only two bones. The firſt of theſe bones ſupports the great toe and is much larger than the reſt, which nearly reſemble each other in ſize.

Theſe bones are articulated by one extremity with the cuneiform bones and the os cuboides, and by their other end with the toes.

71 Of the toes. Each of the toes, like the fingers, conſiſts of three bones, except the great toe, which is formed of two bones. Thoſe of the other four are diſtinguiſhed into three phalanges. Although the toes are more confined in their motion than the fingers, yet they appear to be perfectly fitted for the purpoſes they are deſigned for. In walking, the toes bring the centre of gravity perpendicular to the advanced foot; and as the ſoles of the foot are naturally concave, we can at pleaſure increaſe this concavity, and form a kind of vault, which adjuſts itſelf to the different inequalities that oc-

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(M) This tendon is ſometimes ruptured by jumping, dancing, or other violent efforts.

cur to us in walking; and which, without this mode of arrangement, would incommode us exceedingly, eſpecially when bare-footed.

72. § 4. *Of the Oſſa* Sesamoidea.

Besides the bones we have already deſcribed, there are ſeveral ſmall ones that are met with only in the adult ſkeleton, and in perſons who are advanced in life; which, from their ſuppoſed general reſemblance to the ſeeds of the ſeſamum, are called *oſſa ſeſamoidea.* They are commonly to be ſeen at the firſt joint of the great toe, and ſometimes at the joints of the thumb; they are likewiſe now and then to be found at the lower extremity of the fibula, upon the condyles of the thigh-bone, under the os cuboides of the tarſus, and in other parts of the body. Their ſize and number ſeem conſtantly to be increaſed by age and hard labour; and as they are generally found in ſituations where tendons and ligaments are moſt expoſed to the action of muſcles, they are now generally conſidered as oſſified portions of ligaments or tendons.

The upper ſurface of theſe bones is uſually convex, and adherent to the tendon that covers it; the ſide which is next to the joint is ſmooth and flat. Though their formation is accidental, yet they ſeem to be of ſome uſe, by raiſing the tendons farther from the centre of motion, and conſequently increaſing the power of the muſcles. In the great toe and thumb they are likewiſe uſeful, by forming a groove for the flexor tendons.

EXPLANATION of the PLATES of OSTEOLOGY.

Plate XIX.

Fig. 1. A Front-view of the Male Skeleton. A, The os frontis. B, The os parietale. C, The coronal ſuture. D, The ſquamous part of the temporal bones. E, The ſqamous ſuture. F, The zygoma. G, The maſtoid proceſs. H, The temporal proceſs of the ſphenoid bone. I, The orbit. K, The os malæ. L, The os maxillare ſuperius. M, Its naſal proceſs. N, The oſſa naſi. O, The os unguis. P, The maxilla inferior. Q, The teeth, which are ſixteen in number in each jaw. R, The ſeven cervical vertebræ, with their intermediate cartilages. S, Their tranverſe proceſſes. T, The twelve dorſal vertebræ, with their intermediate cartilages. U, The five lumbar vertebræ. V, Their tranverſe proceſſes. W, The upper part of the os ſacrum. X, Its lateral parts. The holes ſeen on its fore part are the paſſages of the undermoſt ſpinal nerves and ſmall veſſels. Oppoſite to the holes, the marks of the original diviſions of the bone are ſeen. Y, The os ilium. Z, Its creſt or ſpine. a, The anterior ſpinous proceſſes. b, The brim of the pelvis. c, The iſchiatic niche. d, The os iſchium. e, Its tuberoſity. f, Its ſpinous proceſs. g, Its crus. h, The foramen thyroideum. i, The os pubis. k, The ſymphyſis pubis. l, The crus pubis. m, The acetabulum. n, The ſeventh or laſt true rib. o, The twelfth or laſt falſe rib. p, The upper end of the ſternum. q, The middle piece. r, The under end, or cartilage enſiformis. s, The clavicle. t, The internal ſurface of the ſcapula. u, Its acromion. v, Its coracoid proceſs. w, Its cervix. x, The glenoid cavity. y, The os humeri. z, Its head, which is connected to the glenoid cavity. 1, Its external tubercle. 2, Its internal tubercle. 3, The groove for lodging the long head of the biceps muſcle of the arm. 4, The internal condyle. 5, The external condyle. Between 4 and 5, the trochlea. 6, The radius. 7, Its head. 8, Its tubercle. 9, The ulna. 10, Its coronoid proceſs. 11, 12, 13, 14, 15, 16, 17, 18, The carpus; compoſed of os naviculare, os lunare, os cuneiforme, os piſiforme, os trapezium, os trapezoides, os magnum, os unciforme. 19, The five bones of the metacarpus. 20, The two bones of the thumb. 21, The three bones of each of the fingers. 22, The os femoris. 23, Its head. 24, Its cervix. 25, The trochanter major. 26, The trochanter minor. 27, The internal condyle. 28, The external condyle. 29, The rotula. 30, The tibia. 31, Its head. 32, Its tubercle. 33, Its ſpine. 34, The malleolus internus. 35, The fibula. 36, Its head. 37, The malleolus externus. The tarſus is compoſed of, 38, The aſtragalus; 39, The os calcis; 40, The os naviculare; 41, Three oſſa cuneiformia, and the os cuboides, which is not ſeen in this figure. 42, The five bones of the metatarſus. 43, The two bones of the great toe. 44, The three bones of each of the ſmall toes.

Fig. 2. A Front-view of the Skull. A, The os frontis. B, The lateral part of the os frontis, which gives origin to part of the temporal muſcle. C, The ſuperciliary ridge. D, The ſuperciliary hole through which the frontal veſſels and nerves paſs. EE, The orbitar proceſſes. F, The middle of the tranſverſe ſuture, G, The upper part of the orbit. H, The foramen opticum. I, The foramen lacerum. K, The inferior orbitar fiſſure. L, The os unguis. M, The oſſa naſi. N, The os maxillare ſuperius. O, Its naſal proceſs. P, The external orbitar hole through which the ſuperior maxillary veſſels and nerves paſs. Q, The os malæ. R, A paſſage for ſmall veſſels into, or out of, the orbit. S, The under part of the left noſtril. T, The ſeptum narium. U, The os ſpongioſum ſuperius. V, The os ſpongioſum inferius. W, The edge of the alveoli, or ſpongy ſockets, for the teeth. X, The maxilla inferior. Y, The paſſage for the inferior maxillary veſſels and nerves.

Fig. 3. A Side-view of the Skull. A, The os frontis. B, The coronal ſuture. C, The os parietale. D, An arched ridge which gives origin to the temporal muſcle. E, The ſquamous ſuture. F, The ſquamous part of the temporal bone; and, farther forwards, the temporal proceſs of the ſphenoid bone. G, The zygomatic proceſs of the temporal bone. H, The zygomatic ſuture. I, The maſtoid proceſs of the temporal bone. K, The meatus auditorius externus. L, The orbitar plate of the frontal bone, under which is ſeen the tranverſe ſuture. M, The pars plana of the ethmoid bone. N, The os unguis. O, The right os naſi. P, The ſuperior maxillary bone. Q, Its naſal proceſs. R, The two dentes inciſores. S, The dens caninus. T, The two ſmall molares, U, The three large molares. V, The os malæ. W, The lower jaw. X, Its angle. Y, The

coronoid proceſs. Z, The condyloid proceſs, by which the jaw is articulated with the temporal bone.

Fig. 4. The poſterior and right Side of the Skull.

A, The os frontis. B B, The oſſa parietalia. C, The ſagittal ſuture. D, The parietal hole, through which a ſmall vein runs to the ſuperior longitudinal ſinus. E, The lambdoid ſuture. F F, Oſſa triquetra. G, The os occipitis. H, The ſquamous part of the temporal bone. I, The maſtoid proceſs. K, The zygoma. L, The os malæ. M, The temporal part of the ſphenoid bone. N, The ſuperior maxillary bone and teeth.

Fig. 5. The external Surface of the Os Frontis.

A, The convex part. B, Part of the temporal foſſa. C, The external angular proceſs. D, The internal angular proceſs. E, The naſal proceſs. F, The ſuperciliary arch. G, The ſuperciliary hole. H, The orbitar plate.

Fig. 6. The Interior Surface of the Os Frontis.

A A, The ſerrated edge which aſſiſts to form the coronal ſuture. B, The external angular proceſs. C, The internal angular proceſs. D, The naſal proceſs. E, The orbitar plate. F, The cells which correſpond with thoſe of the ethmoid bone. G, The paſſage from the frontal ſinus. H, The opening which receives the cribriform plate of the ethmoid bone. I, The cavity which lodges the fore part of the brain. K, The ſpine to which the falx is fixed. L, The groove which lodges the ſuperior longitudinal ſinus.

Plate XX.

Fig. 1. A Back-view of the Skeleton.

A A, The oſſa parietalia. B, The ſagittal ſuture. C, The lambdoid ſuture. D, The occipital bone. E, The ſquamous ſuture. F, The maſtoid proceſs of the temporal bone. G, The os malæ. H, The palate plates of the ſuperior maxillary bones. I, The maxilla inferior. K, The teeth of both jaws. L, The ſeven cervical vertebræ. M, Their ſpinous proceſſes. N, Their tranſverſe and oblique proceſſes. O, The laſt of the twelve dorſal vertebræ. P, The fifth or laſt lumbar vertebra. Q, The tranſverſe proceſſes. R, The oblique proceſſes. S, The ſpinous proceſſes. T, The upper part of the os ſacrum. U, The poſterior holes which tranſmit ſmall blood-veſſels and nerves. V, The under part of the os ſacrum which is covered by a membrane. W, The os coccygis. X, The os ilium. Y, Its ſpine or creſt. Z, The iſchiatic niche. a, The os iſchium. b, Its tuberoſity. c, Its ſpine. d, The os pubis. e, The foramen hydroideum. f, The ſeventh or laſt true rib. g, The twelfth or laſt falſe rib. h, The clavicle. i, the ſcapula. k, Its ſpine. l, Its acromion. m, Its cervix. n, Its ſuperior coſta. o, Its poſterior coſta. p, Its inferior coſta. q, The os humeri. r. The radius. s, The ulna. t, Its oleclarnon. u, All the bones of the carpus, excepting the os piſiforme, which is ſeen in Plate XIX. (fig. 1. v, The five bones of the matacarpus. w, The two bones of the thumb. x, The three bones of each of the fingers. y, The two ſeſamoid bones at the root of the left thumb. z, The os femoris. 1, The trochanter major. 2, The trochanter minor. 3, The linea aſpera. 4, The internal condyle. 5, The external condyle. 6 6, The ſimilunar cartilages. 7, The tibia. 8, The malleolus internus. 9, The fibula. 10, The mallelous externus. 11. The tarſus. 12, The metatarſus. 13, The toes.

Fig. 2. The External Surface of the Left Os Parietale.

A, The convex ſmooth ſurface. B, The parietal hole. C, An arch made by the beginning of the temporal muſcle.

Fig. 3. The Internal Surface of the ſame bone.

A, Its ſuperior edge, which, joined with the other, forms the ſagittal ſuture. B, The anterior edge, which aſſiſts in the formation of the coronal ſuture. C, The inferior edge for the ſquamous ſuture. D, The poſterior edge for the lambdoid ſuture. E, A depreſſion made by the lateral ſinus. F F, The prints of the arteries of the dura mater.

Fig. 4. The External Surface of the Left Os Temporum.

A, The ſquamous part. B, The maſtoid proceſs. C, The zygomatic proceſs. D, The ſtyloid proceſs. E, The petroſal proceſs. F, The meatus auditorius externus. G, The glenoid cavity for the articulation of the lower jaw. H, The foramen ſtylo-maſtoideum for the portio dura of the ſeventh pair of nerves. I, Paſſages for blood-veſſels into the bone. K, The foramen maſtoideum through which a vein goes to the lateral ſinus.

Fig. 5. The Internal Surface of the Left Os Temporum.

A, The ſquamous part; the upper edge of which aſſiſts in forming the ſquamous ſuture. B, The maſtoid proceſs. C, The ſtyloid proceſs. D, The pars petroſa. E, The entry of the ſeventh pair, or auditory nerve. F, The foſſa, which lodges a part of the lateral ſinus. G, The foramen maſtoideum.

Fig. 6. The External Surface of the Osseous Circle, which terminates the meatus auditorious externus.

A, The anterior part. B, A ſmall part of the groove in which the membrana tympani is fixed.

N. B. This, with the ſubſequent bones of the ear, are here delineated as large as the life.

Fig. 7. The Internal Surface of the Osseous Circle.

A, The anterior part. B, The groove in which the membrana tympani is fixed.

Fig. 8. The Situation and Connection of the Small Bones of the Ear.

A, The malleus. B, The incus. C, The os orbiculare. D, The ſtapes.

Fig. 9. The Malleus, with its Head, Handle, and Small Proceſſes.

Fig. 10. The Incus, with its Body, Superior and Inferior Branches.

Fig. 11. The Os Orbiculare.

Fig. 12. The Stapes, with its Head, Baſe, and two Crura.

Fig. 13. An Internal View of the Labyrinth of the Ear.

A, The hollow part of the cochlea, which forms a ſhare of the meatus auditorius internus. B, The veſtibulum. C C C, The ſemicircular canals.

Fig. 14. An External View of the Labyrinth.

A, the ſemicircular canals. B, The feneſtra ovalis which leads into the veſtibulum. C, The feneſtra rotunda which opens into the cochlea. D, The different turns of the cochlea.

Fig. 15. The Internal Surface of the Os Sphenoides.

A A, The temporal proceſſes. B B, The pterygoid proceſſes. C C, The ſpinous proceſſes. D D, The anterior clinoid proceſſes. E. The poſterior clinoid proceſs. F, The anterior proceſs which joins the ethmoid bone. G, The ſella turcica for lodging the glandula pituitaria. H, The foramen opticum. K, The foramen lacerum. L, The foramen rotundum. M, The foramen ovale. N, The foramen ſpinale.

Fig. 16. The External Surface of the Os Sphenoides.

A A, The temporal proceſſes. B B, The pterygoid proceſſes. C C, The ſpinous proceſſes. D, The proceſſus azygos. E, The ſmall triangular proceſſes which grow from the body of the bone. F F, The orifices of the ſphenoidal ſinuſes. G, The foramen lacerum. H, The foramen rotundum. I, The foramen ovale. K, The foramen pterygoideum.

Fig. 17. The External View of the Os Ethmoides.

A, The naſal lamella. B B, The grooves between the naſal lamella and oſſa ſpongioſa ſuperiora. C C, The oſſa ſpongioſa ſuperiora. D D, The ſphenoidal cornua. See Fig. 16. E.

Fig. 18. The Internal View of the Os Ethmoides.

A, The criſta galli. B, The cribriform plate, with the different paſſages of the olfactory nerves. C C, Some of the ethmoidal cells. D, The right os planum. E E, The ſphenoidal cornua.

Fig. 19. The right Sphenoidal Cornu.

Fig. 20. The left Sphenoidal Cornu.

Fig. 21. The External Surface of the Os Occipitis.

A, The upper part of the bone. B, The ſuperior arched ridge. C, The inferior arched ridge. Under the arches are prints made by the muſcles of the neck. D D, The two condyloid proceſſes which articulate the head with the ſpine. E, The cuneiform proceſs. F, The foramen magnum through which the ſpinal marrow paſſes. G G, The poſterior condyloid foramina which tranſmit veins into the lateral ſinuſes. H H, The foramina lingualia for the paſſage of the nine pair of nerves.

Fig. 22. The internal Surface of the Os Occipitis.

A A, The two ſides which aſſiſt to form the lambdoid ſuture. B, The point of the cuneiform proceſs, where it joins the ſphenoid bone. C C, The prints made by the poſterior lobes of the brain. D D, Prints made by the lobes of the cerebellum. E, The cruciform ridge for the attachment of the proceſſes of the dura mater. F, The courſe of the ſuperior longitudinal ſinuſes. G G, The courſe of the two lateral ſinuſes. H, The foramen magnum. I I, The poſterior condyloid foramina.

Plate XXI.

Fig. 1. A Side-view of the Skeleton.

A A, The oſſa parietalia. B, The ſagittal ſuture. C, The os occipitis. D D, The lambdoid ſuture. E, The ſquamous part of the temporal bone. F, The maſtoid proceſs. G, The meatus auditorius externus. H, The os frontis. I, The os malæ. K, The os maxillare ſuperius. L, The maxilla inferior. M, The teeth of both jaws. N, The ſeventh, or laſt cervical vertebra. O, The ſpinous proceſſes. P, Their tranſverſe and oblique proceſſes. Q, The twelfth or laſt dorſal vertebra. R, The fifth, or laſt lumbar vertebra. S, The ſpinous proceſſes. T, Openings between the vertebræ for the paſſage of the ſpinal nerves. U, The under end of the os ſacrum. V, The os coccygis. W, The os ilium. X, The anterior ſpinous proceſſes. Y, The poſterior ſpinous proceſſes. Z, The iſchiatic niche. a, The right os ilium. b, The oſſa pubis. c, The tuberoſity of the left os iſchium. d, The ſcapula. e, Its ſpine. f, The os humeri. g, The radius. h, The ulna. i, The carpus. k, The metacarpal bone of the thumb. l, The metacarpal bones of the fingers. m, The two bones of the thumb. n, The three bones of each of the fingers. o, The os femoris. p, Its head. q, The trochanter major. r, The external condyle. s, The rotula. t, The tibia, u, The fibula. v, The malleolus externus. w, The aſtragalus. x, The os calcis. y, The os naviculare, z, The three oſſa cuneiformia. 1, The os cuboides. 2, The five metatarſal bones. 3, The two bones of the great toe. 4, The three bones of each of the ſmall toes.

Fig. 2. A View of the Internal Surface of the Baſe of the Skull.

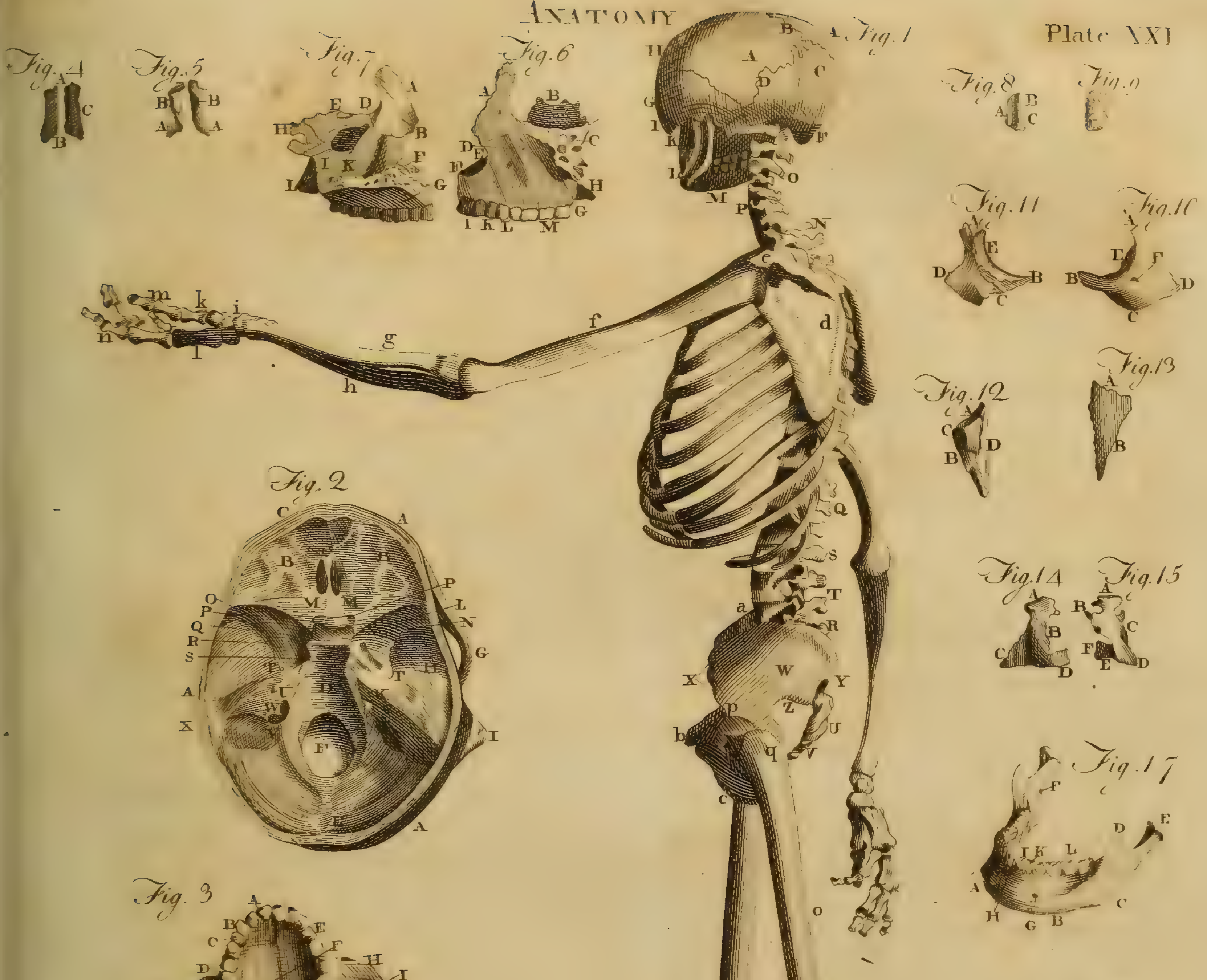
A A A, The two tables of the ſkull with the diploë. B B, The orbitar plates of the frontal bone. C, The criſta galli, with cribriform plate of the ethmoidal bone on each ſide of it, through which the firſt pair of nerves paſs. D, The cuneiform proceſs of the occipital bone. E, The cruciform ridge. F, The foramen magnum for the paſſage of the ſpinal marrow. G, The zygoma, made by the joining of the zygomatic proceſſes of the os temporum and os malæ. H, The pars ſquamoſa of the os temporum. I, The pars mammillaris. K, The pars petroſa. L, The temporal proceſs of the ſphenoid bone. M M, The anterior clinoid proceſſes. N, The poſterior clinoid proceſs. O, The ſella turcica. P, The foramen opticum, for the paſſage of the optic nerve and ocular artery of the left ſide. Q, The foramen lacerum, for the third, fourth, ſixth, and firſt of the fifth pair of nerves and ocular vein. R, The foramen rotundum, for the ſecond of the fifth pair. S, The foramen ovale, for the third of the fifth pair. T, The foramen ſpinale, for the principal artery of the dura mater. U, The entry of the auditory nerve. V, The paſſage for the lateral ſinus. W, The paſſage of the eighth pair of nerves. X, The paſſage of the ninth pair.

Fig. 3. A View of the External Surface of the Baſe of the Skull.

A, The two dentes inciſores of the right ſide. B, The dens caninus. C, The two ſmall molares. D, The three large molares. E, The foramen inciſivum, which gives paſſage to ſmall blood-veſſels and nerves. F, The palate-

ANATOMY

Plate XXI



Law. Philadª

palate-plates of the oſſa maxillaria and palati, joined by the longitudinal and tranſverſe palate futures. G, The foramen palatinum poſterius, for the palatine veſſels and nerves. H, The os maxillare ſuperius of the right ſide. I, The os malæ. K, The zygomatic proceſs of the temporal bone. L. The poſterior extremity of the oſſa ſpongioſa. M, The poſterior extremity of the vomer, which forms the back-part of the ſeptum naſi. N, The pterygoid proceſs of the right ſide of the ſphenoid bone. O O, The foramina ovalia. P P, The foramina ſpinalia. Q Q, The paſſages of the internal carotid arteries. R, A hole between the point of each pars petroſa and cuneiform proceſs of the occipital bone, which is filled up with a ligamentous ſubſtance in the recent ſubject. S, The paſſage of the left lateral ſinus. T, The poſterior condyloid foramen of the left ſide. U, The foramen maſtoideum. V, The foramen magnum. W, The inferior orbitar fiſſure. X, The glenoid cavity, for the articulation of the lower jaw. Y, The ſquamous part of the temporal bone. Z, The maſtoid proceſs, at the inner ſide of which is a foſſa for the poſterior belly of the digaſtric muſcle. a, The ſtyloid proceſs. b, The meatus auditorius externus. c, The left condyle of the occipital bone. d, The perpendicular occipital ſpine. e e, The inferior horizontal ridge of the occipital bone. f f, The ſuperior horizontal ridge, which is oppoſite to the crucial ridge where the longitudinal ſinus divides to form the lateral ſinuſes. g g g, The lambdoid ſuture. h, The left ſquamous ſuture. i, The parietal bone.

Fig. 4. The anterior ſurface of the Ossa Nasi.

A, The upper part, which joins the os frontis. B, The under end, which joins the cartilage of the noſe. C, The inner edge, where they join each other.

Fig. 5. The poſterior ſurface of the Ossa Nasi.

A A, Their cavity, which forms part of the arch of the noſe. B B, Their ridge or ſpine, which projects a little to be fixed to the fore-part of the ſeptum narium.

Fig. 6. The external ſurface of the Os Maxillare Superius of the left ſide.

A, The naſal proceſs. B, The orbitar plate. C, The unequal ſurface which joins the os malæ. D, The external orbitar hole. E, The opening into the noſtril. F, The palate-plate. G, The maxillary tuberoſity. H, part of the os palati. I, The two dentes inciſores. K, The dens caninus. L, The two ſmall dentes molares. M, The three large dentes molares.

Fig. 7. The internal ſurface of the Os Maxillare Superius and Os Palati.

A, The naſal proceſs. B B, Eminences for the connection of the os ſpongioſum inferius. D, The under end of the lachrymal groove. E, The antrum maxillare. F, The naſal ſpine, between which and B is the cavity of the noſtril. G, The palate-plate. H, The orbitar part of the os palati. I, The naſal plate. K, The ſuture which unites the maxillary and palate bones. L, The pterygoid proceſs of the palate bones.

Fig. 8. The external ſurface of the right Os Unguis.

A, The orbitar part. B, The lachrymal part. C, The ridge between them.

Fig. 9. The internal ſurface of the right Os Unguis.

This ſide of the bone has a furrow oppoſite to the external ridge; all behind that is irregular, where it covers part of the ethmoidal cells.

Fig. 10. The external ſurface of the left Os Malæ.

A, The ſuperior orbitar proceſs. B, The inferior orbitar proceſs. C, The malar proceſs. D, The zygomatic proceſs. E, The orbitar plate. F, A paſſage for ſmall veſſels into or out of the orbit.

Fig. 11. The internal ſurface of the left Os Malæ.

A, The ſuperior orbitar proceſs. B, The inferior orbitar proceſs. C, The malar proceſs. D, The zygomatic proceſs. E, The internal orbitar plate or proceſs.

Fig. 12. The external ſurface of the right Os Spongiosum Inferius.

A, The anterior part. B, The hook-like proceſs for covering part of the antrum maxillare. C, A ſmall proceſs which covers part of the under end of the lachrymal groove. D, The inferior edge turned a little outwards.

Fig. 13. The internal ſurface of the Os Spongiosum Inferius.

A, The anterior extremity. B, The upper edge which joins the ſuperior maxillary and palate bones.

Fig. 14. The poſterior and external ſurface of the right Os Palati.

A, The orbitar proceſs. B, The naſal lamella. C, The pterygoid proceſs. D, The palate proceſs.

Fig. 15. The anterior and external ſurface of the right Os Palati.

A, The orbitar proceſs. B, An opening through which the lateral naſal veſſels and nerves paſs. C, The naſal lamella. D, The pterygoid proceſs. E, The poſterior edge of the palate proceſs for the connection of the velum palati. F, The inner edge by which the two oſſa palati are connected.

Fig. 16. The right ſide of the Vomer.

A, The upper edge which joins the naſal lamella of the ethmoid bone and the middle cartilage of the noſe. B, The inferior edge, which is connected to the ſuperior maxillary and palate bones. C, The ſuperior and poſterior part which receives the proceſſus azygos of the ſphenoid bone.

Fig. 17. The Maxilla Inferior.

A, The chin. B, The baſe and left ſide. C, The angle. D, The coronoid proceſs. E, The condyloid proceſs. F, The beginning of the inferior maxillary canal of the right ſide, for the entry of the nerve and blood-veſſels. G, The termination of the left canal. H, The two dentes inciſores. I, The dens caninus. K, The two ſmall molares. L, The three large molares.

Fig. 18. The different claſſes of the Teeth.

1, 2, A fore and back view of the two anterior dentes inciſores of the lower jaw. 3, 4, Similar teeth of the upper jaw. 5, 6, A fore and back view of the dentes canini. 7, 8, The anterior dentes molares. 9, 10 11, The poſterior dentes molares. 12, 13, 14, 15, 16, Unuſual appearances in the ſhape and ſize of the teeth.

Fig. 19. The external ſurface of the Os Hyoides.
A, The body. B B, The cornua. CC, The appendices.

Plate XXII.

Fig. 1. A Poſterior View of the Sternum and Clavicles, with the ligament connecting the clavicles to each other.

a, The poſterior ſurface of the ſternum. b b, The broken ends of the clavicles. c c c c, The tubercles near the extremity of each clavicle. d, The ligament connecting the clavicles.

Fig. 2. A Fore-view of the Left Scapula, and of a half of the Clavicle, with their Ligaments.

a, The ſpine of the ſcapula. b, The acromion. c, The inferior angle. d, Inferior coſta. e, Cervix. f, Glenoid cavity, covered with cartilage for the arm-bone. g g, The capſular ligament of the joint. h, Coracoid proceſs. i, The broken end of the clavicle. k, Its extremity joined to the acromion. l, A ligament coming out ſingle from the acromion to the coracoid proceſs. m, A ligament coming out ſingle from the acromion, and dividing into two, which are fixed to the coracoid proceſs.

Fig. 3. The Joint of the Elbow of the Left Arm, with the Ligaments.

a, The os humeri. b, Its internal condyle. c c, The two prominent parts of its trochlea appearing through the capſular ligament. d, The ulna. e, The radius, f, The part of the ligamen tincluding the head of the radius.

Fig. 4. The Bones of the Right-Hand, with the Palm in view.

a, The radius. b, The ulna. c, The ſcaphoid bone of the carpus. d, The os lunare. e, The os cuneiforme. f, The os piſiforme. g, Trapezium. h, Trapezoides. i, Capitatum. k, Unciforme. l. The four metacarpal bones of the fingers. m, The firſt phalanx. n, The ſecond phalanx. o, The third phalanx. p, The metacarpal bone of the thumb. q, The firſt joint. r, The ſecond joint.

Fig. 5. The Poſterior View of the Bones of the Left Hand.

The explication of Fig. 4. ſerves for this figure; the ſame letters pointing out the ſame bones, though in a different view.

Fig. 6. The Upper Extremity of the Tibia, with the Semilunar Cartilages of the Joint of the Knee, and ſome Ligaments.

a, The ſtrong ligament which connects the rotula to the tubercle of the tibia. b b, The parts of the extremity of the tibia, covered with cartilage, which appear within the ſemilunar cartilages. c c, The ſemilunar cartilages. d, The two parts of what is called the croſs ligament.

Fig. 7. The Poſterior View of the Joint of the Right Knee.

a, The os femoris cut. b, Its internal condyle. c, Its external condyle. d, The back-part of the tibia. e, The ſuperior extremity of the fibula. f, The edge of the internal ſemilunar cartilage. g, An oblique ligament. h, A larger perpendicular ligament. i, A ligament connecting the femur and fibula.

Fig. 8. The Anterior View of the Joint of the Right Knee.

b, The internal condyle. c, Its external condyle. d, The part of the os femoris, on which the patella moves. e, A perpendicular ligament. f f, The two parts of the crucial ligaments. g g, The edges of the two moveable ſemilunar cartilages. h, The tibia. i, The ſtrong ligament of the patella. k, The back part of it where the fat has beeen diſſected away. l, The external depreſſion. m, The internal one. n, The cut tibia.

Fig. 9. A View of the inferior part of the Bones of the Right Foot.

a, The great knob of the os calcis. b, A prominence on its outſide. c, The hollow for the tendons, nerves, and blood-veſſels. d, The anterior extremity of the os calcis. e, Part of the aſtragalus. f, Its head covered with cartilage. g, The internal prominence of the os naviculare. h, The os cuboides. i, The os cuneiforme internum; k,—Medium; l,—Externum. m, The metatarſal bones of the four leſſer toes. n, The firſt—o, The ſecond—p, The third phalanx of the four leſſer toes. q, The metatarſal bones of the great toe. r, Its firſt—s, Its ſecond joint.

Fig. 10. The Inferior Surface of the two large Sesamoid Bones, at the firſt Joint of the Great Toe.

Fig. 11. The Superior View of the Bones of the Right Foot.

a, b, as in Fig. 9. c, The ſuperior head of the aſtragalus. d, *&c.* as in Fig. 9.

Fig. 12. The View of the Sole of the Foot, with its Ligaments.

a, The great knob of the os calcis. b, The hollow for the tendons, nerves, and blood-veſſels. c, The ſheaths of the flexores pollicis and digitorum longi opened. d, The ſtrong cartilaginous ligament ſupporting the head of the aſtragalus. e, h, Two ligaments which unite into one, and are fixed to the metatarſal bone of the great toe. f, A ligament from the knob of the os calcis to the metatarſal bone of the little toe. g, A ſtrong triangular ligament, which ſupports the bones of the tarſus. i, The ligaments of the joints of the five metatarſal bones.

Fig. 13. a, The head of the thigh bone of a child. b, The ligamentum rotundum connecting it to the acetabulum, c, The capſular ligament of the joint with its arteries injected. d, The numerous veſſels of the mucilaginous gland injected.

Fig. 14. The Back-view of the Cartilages of the Larynx, with the Os Hyoides.

a, The poſterior gart of the baſe of the os hyoides. b b, Its cornua. c, The appendix of the right ſide. d, A ligament ſent out from the appendix of the left ſide, to the ſtyloid proceſs of the temporal bone. e, The union of the baſe with the left cornu. f f, The poſterior ſides of (g) the thyroid cartilage. h h, Its ſuperior

Fig. 1

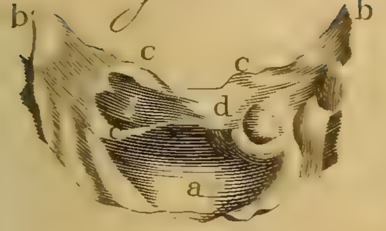
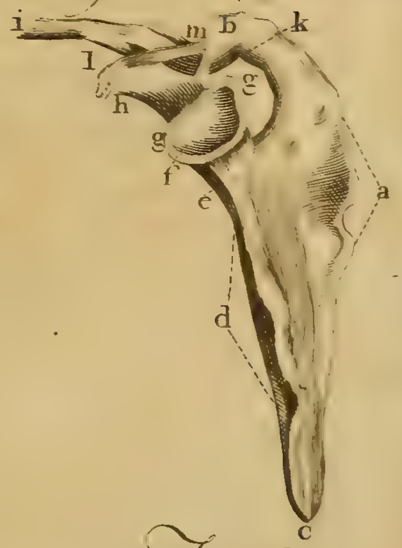


Fig. 2



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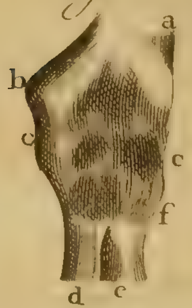

Fig. 4

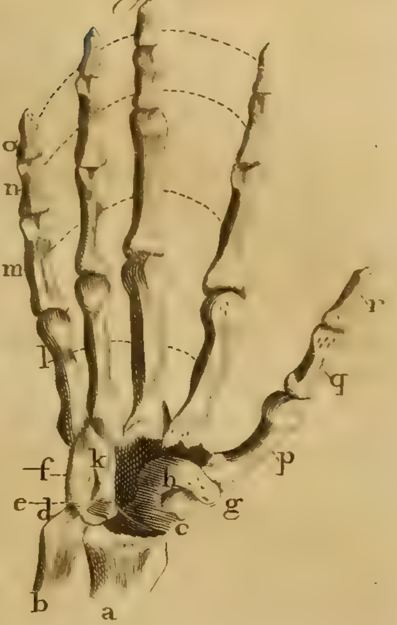

Fig. 5

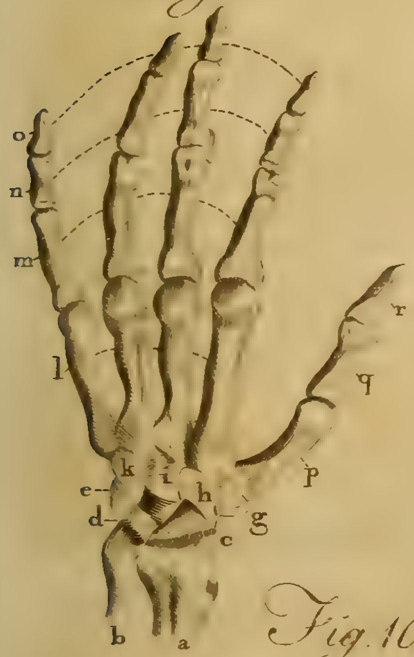

Fig. 6

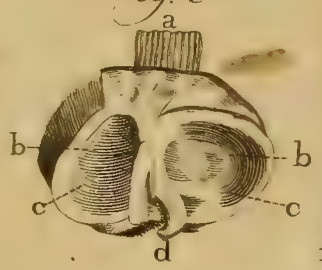

Fig. 7

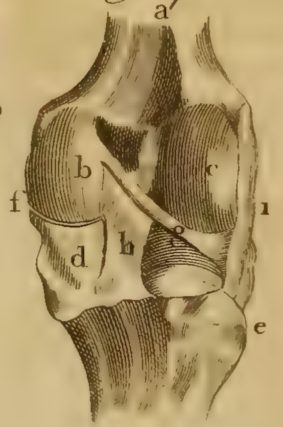

Fig. 8

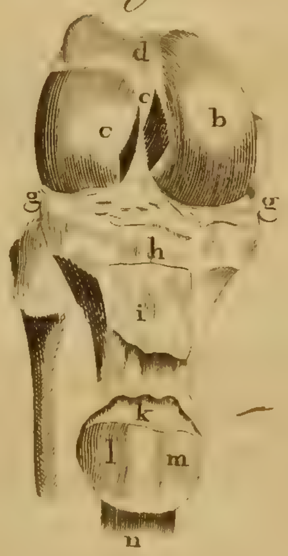

Fig. 10

Fig. 9

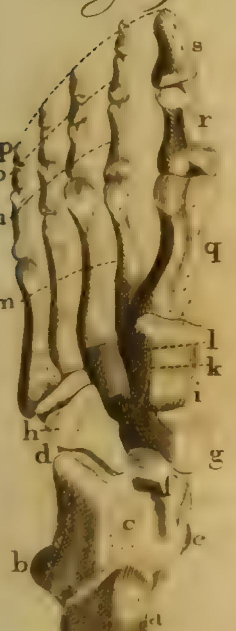

Fig. 11

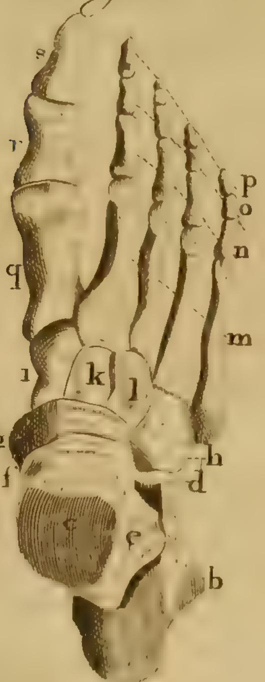

Fig. 12

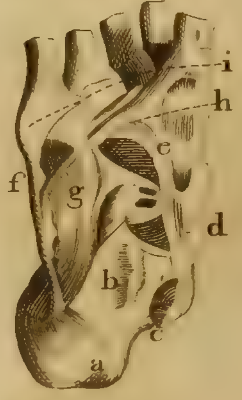

Fig. 13

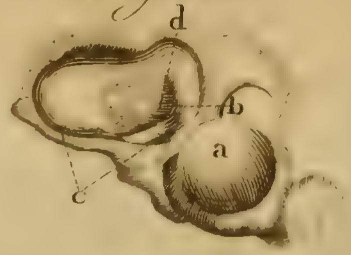

Fig. 14

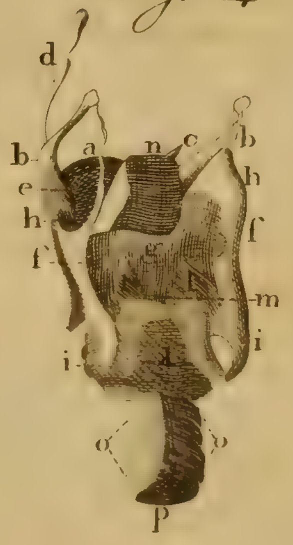

Fig. 15

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ſuperior cornua. i i, Its inferior cornua. k, The cricoid cartilage. l l, The arytenoid cartilages. m, The entry into the lungs, named *glottis*. n, The epiglottis. o o, The ſuperior cartilages of the trachea. p, Its ligamentous back-part.

FIG. 15. The Superior Concave ſurface of the SESAMOID BONES at the firſt joint of the Great Toe, with their Ligaments.

a, Three ſeſamoid bones. b, The ligamentous ſubſtance in which they are formed.

PART II. OF THE SOFT PARTS IN GENERAL;

OF THE COMMON INTEGUMENTS, WITH THEIR APPENDAGES;

AND OF THE MUSCLES,

73 ANATOMICAL writers uſually proceed to a deſcription of the muſcles after having finiſhed the oſteology; but we ſhall deviate a little from the common method, with a view to deſcribe every thing clearly and diſtinctly, and to avoid a tautology which would otherwiſe be unavoidable. All the parts of the body are ſo intimately connected with each other, that it ſeems impoſſible to convey a juſt idea of any one of them, without being in ſome meaſure obliged to ſay ſomething of others; and on this account we wiſh to mention in this place the names and ſituation of the principal viſcera of the body, that when mention is hereafter made of any one of them in the courſe of the work, the reader may at leaſt know where they are placed.

After this little digreſſion, the common integuments, and after them the muſcles will be deſcribed; we then propoſe to enter into an examination of the ſeveral viſcera and their different functions. In deſcribing the brain, occaſion will be taken to ſpeak of the nerves and animal ſpirits. The circulation of the blood will follow the anatomy of the heart, and the ſecretions and other matters will be introduced in their proper places.

The body is divided into three great cavities. Of theſe the uppermoſt is formed by the bones of the cranium, and incloſes the brain and cerebellum.

The ſecond is compoſed of the vertebræ of the back, the ſternum, and true ribs, with the additional aſſiſtance of muſcles, membranes, and common integuments, and is called the *thorax*.—It contains the heart and lungs.

The third, and inferior cavity, is the abdomen. It is ſeparated from the thorax by means of the diaphragm, and is formed by the lumbar vertebræ, the os ſacrum, the oſſa innominata, and the falſe ribs, to which we may add the peritonæum, and a variety of muſcles. This cavity incloſes the ſtomach, inteſtines, omentum or cawl, liver, pancreas, ſpleen, kidneys, urinary bladder, and parts of generation.

Under the diviſion of common integuments are uſually included the epidermis, or ſcarf-ſkin, the reticulum mucoſum of Malpighi, the cutis or true ſkin, and the membrana adipoſa.—The hair and nails, as well as the ſebaceous glands may be conſidered as appendages to the ſkin.

SECT. I. *Of the* SKIN.

§ 1. *Of the* SCARF-*ſkin*.

74 Cuticula. THE epidermis, cuticula, or ſcarf-ſkin, is a fine, tranſparent, and inſenſible pellicle, deſtitute of nerves and blood-veſſels, which inveſts the body, and everywhere covers the true ſkin. This ſcarf-ſkin, which ſeems to be very ſimple, appears, when examined with a microſcope, to be compoſed of ſeveral laminæ or ſcales which are increaſed by preſſure, as we may obſerve in the hands and feet, where it is frequently much thickened, and becomes perfectly callous. It ſeems to adhere to the cutis by a number of very minute filaments, but may eaſily be ſeparated from it by heat, or by maceration in water. Some anatomical writers have ſuppoſed that it is formed by a moiſture exhaled from the whole ſurface of the body, which gradually hardens when it comes into contact with the air. They were perhaps induced to adopt this opinion, by obſerving the ſpeedy regeneration of this part of the body when it has been by any means deſtroyed, it appearing to be renewed on all parts of the ſurface at the ſame time; whereas other parts which have been injured, are found to direct their growth from their circumference only towards their centre. But a demonſtrative proof that the epidermis is not a fluid hardened by means of the external air, is that the fœtus in utero is found to have this covering. Lieuwenhoeck ſuppoſed its formation to be owing to the expanſion of the extremities of the excretory veſſels which are found everywhere upon the ſurface of the true ſkin. Ruyſch attributed its origin to the nervous papillæ of the ſkin; and Heiſter thinks it probable, that it may be owing both to the papillæ and the excretory veſſels. The celebrated Morgagni, on the other hand, contends*, that it is nothing more than the ſurface of the cutis, hardened and rendered inſenſible by the liquor amnii in utero, and by the preſſure of the air. This is a ſubject, however, on which we can advance nothing with certainty.

The cuticle is pierced with an infinite number of pores or little holes, which afford a paſſage to the hairs, ſweat, and inſenſible perſpiration, and likewiſe to warm water, mercury, and whatever elſe is capable of being taken in by the abſorbents of the ſkin. The lines which we obſerve on the epidermis belong to the true ſkin. The cuticle adjuſts itſelf to them, but does not form them.

§ 2. *Of the Rete Mucoſum.*

75 Rete mucoſum. BETWEEN the epidermis and cutis we meet with an appearance to which Malpighi, who firſt deſcribed it, gave the name of *rete mucoſum*, ſuppoſing it to be of a membranous ſtructure, and pierced with an infinite number of pores; but the fact is, that it ſeems to be nothing more than a mucous ſubſtance which may be diſſolved by macerating it in water, while the cuticle and cutis preſerve their texture.

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* *Adverſar. Anat.* II. *Animadver.* 2.

The colour of the body is found to depend on the colour of this rete mucoſum; for in negroes it is obſerved to be perfectly black, whilſt the true ſkin is of the ordinary colour.

The bliſters which raiſe the ſkin when burnt or ſcalded, have been ſuppoſed by ſome to be owing to a rarefaction of this mucus; but they are more probably occaſioned by an increaſed action of the veſſels of the part, together with an afflux and effuſion of the thinner parts of the blood.

§ 3. *Of the* CUTIS, *or True Skin.*

76 Cutis. THE cutis is compoſed of fibres cloſely compacted together, as we may obſerve in leather, which is the prepared ſkin of animals. Theſe fibres form a thick network, which everywhere admits the filaments of nerves, and an infinite number of blood-veſſels and lymphatics.

The cutis, when the epidermis is taken off, is found to have, throughout its whole ſurface, innumerable papillæ, which appear like very minute granulations, and ſeem to be calculated to receive the impreſſions of the touch, being the moſt eaſily obſerved where the ſenſe of feeling is the moſt delicate, as in the palms of the hands and on the fingers.

Theſe papillæ are ſuppoſed by many anatomical writers to be continuations of the pulpy ſubſtance of nerves, whoſe coats have terminated in the cellular texture of the ſkin. The great ſenſibility of theſe papillæ evidently proves them to be exceedingly nervous; but ſurely the nervous fibrillæ of the ſkin are of themſelves ſcarcely equal to the formation of theſe papillæ, and it ſeems to be more probable that they are formed like the reſt of the cutis.

Theſe papillæ being deſcribed, the uſes of the epidermis and the reticulum mucoſum will be more eaſily underſtood; the latter ſerving to keep them conſtantly moiſt, while the former protects them from the external air, and modifies their too great ſenſibility.

§ 4. *Of the* GLANDS *of the Skin.*

77 The ſebaceous glands. In different parts of the body we meet, within the ſubſtance of the ſkin, with certain glands or follicles, which diſcharge a fat and oily humour that ſerves to lubricate and ſoften the ſkin. When the fluid they ſecrete has acquired a certain degree of thickneſs, it approaches to the colour and conſiſtence of ſuet; and from this appearance they have derived their name of *ſebaceous glands*. They are found in the greateſt number in the noſe, ear, nipple, axilla, groin, ſcrotum, vagina, and prepuce.

Beſides theſe ſebaceous glands, we read, in anatomical books, of others that are deſcribed as ſmall ſpherical bodies placed in all parts of the ſkin, in much greater abundance than thoſe juſt now mentioned, and named *miliary*, from their ſuppoſed reſemblance to millet-ſeed. Steno, who firſt deſcribed theſe glands, and Malpighi, Ruyſch, Verheyen, Winſlow, and others, who have adopted his opinions on this ſubject, ſpeak of them as having excretory ducts, that open on the ſurface of the cuticle, and diſtil the ſweat and matter of inſenſible perſpiration; and yet, notwithſtanding the poſitive manner in which theſe pretended glands have been ſpoken of, we are now ſufficiently convinced that their exiſtence is altogether imaginary.

§ 5. *Of the* INSENSIBLE *Perſpiration and* SWEAT.

78 Inſenſible perſpiration. THE matter of inſenſible perſpiration, or in other words, the ſubtile vapour that is continually exhaling from the ſurface of the body, is not ſecreted by any particular glands, but ſeems to be derived wholly from the extremities of the minute arteries that are everywhere diſperſed through the ſkin. Theſe exhaling veſſels are eaſily demonſtrated in the dead ſubject, by throwing water into the arteries; for then ſmall drops exude from all parts of the ſkin, and raiſe up the cuticle, the pores of which are cloſed by death; and in the living ſubject, a looking-glaſs placed againſt the ſkin, is ſoon obſcured by the vapour. Bidloo fancied he had diſcovered ducts leading from the cutis to the cuticle, and tranſmitting this fluid; but in this he was miſtaken.

When the perſpiration is by any means increaſed, and ſeveral drops that were inſenſible when ſeparate, are united together and condenſed by the external air, they form upon the ſkin ſmall, but viſible, drops called *ſweat* (N). This particularly happens after much exerciſe, or whatever occaſions an increaſed determination of fluids to the ſurface of the body; a greater quantity of perſpirable matter being in ſuch caſes carried through the paſſages that are deſtined to convey it off.

79 Whether theſe are one and the ſame or different excretions. It has been diſputed, indeed, whether the inſenſible perſpiration and ſweat are to be conſidered as one and the ſame excretion, differing only in degree; or whether they are two diſtinct excretions derived from different ſources. In ſupport of the latter opinion, it has been alledged, that the inſenſible perſpiration is agreeable to nature, and eſſential to health, whereas ſweat may be conſidered as a ſpecies of diſeaſe. But this argument proves nothing; and it ſeems probable, that both the inſenſible vapour and the ſweat are exhaled in a ſimilar manner, though they differ in quantity, and probably in their qualities; the former being more limpid, and ſeemingly leſs impregnated with ſalts than the latter: at any rate we may conſider the ſkin as an emunctory through which the redundant water, and ſometimes the other more ſaline parts of the blood, are carried off.

80 Their uſes. But the inſenſible perſpiration is not confined to the ſkin only—a great part of what we are conſtantly throwing off in this way is from the lungs. The quantity of fluid exhaled from the human body by this inſenſible perſpiration is very conſiderable. Sanctorius (O) an Italian phyſician, who indefatigably paſſed a great many

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(N) Lieuwenhoeck aſſerts that one drop of ſweat is formed by the conflux of fifteen drops of perſpirable vapour.

(O) The inſenſible perſpiration is ſometimes diſtinguiſhed by the name of this phyſician, who was born in the territories of Venice, and was afterwards a profeſſor in the univerſity of Padua. After eſtimating the aliment he took in, and the ſenſible ſecretions and diſcharges, he was enabled to aſcertain with great accuracy the weight or quantity of inſenſible perſpiration by means of a ſtatical chair which he contrived for this purpoſe; and many years in a ſeries of ſtatical experiments, demonſtrated long ago what has been confirmed by later obſervations, that the quantity of vapour exhaled from the ſkin and from the ſurface of the lungs, amounts nearly to 5-8ths of the aliment we take in. So that if in the warm climate of Italy a perſon eats and drinks the quantity of eight pounds in the courſe of a day, five pounds of it will paſs off by inſenſible perſpiration, while three pounds only will be evacuated by ſtool, urine, ſaliva, &c. But in countries where the degree of cold is greater than in Italy, the quantity of perſpired matter is leſs; in ſome of the more northern climates, it being found not to equal the diſcharge by urine. It is likewiſe obſerved to vary according to the ſeaſon of the year, and according to the conſtitution, age, ſex, diſeaſes, diet, exerciſe, paſſions, &c. of different people.

From what has been ſaid on this ſubject, it will be eaſily conceived, that this evacuation cannot be either much increaſed or diminiſhed in quantity without affecting the health.

The perſpirable matter and the ſweat are in ſome meaſure analogous to the urine, as appears from their taſte and ſaline nature (P). And it is worthy of obſervation, that when either of theſe ſecretions is increaſed in quantity, the other is diminiſhed; ſo that they who perſpire the leaſt, uſually paſs the greateſt quantity of urine, and vice verſa.

§ 6. *Of the* NAILS.

81 The nails.

THE nails are of a compact texture, hard and tranſparent like horn. Their origin is ſtill a ſubject of diſpute. Malpighi ſuppoſed them to be formed by a continuation of the papillæ of the ſkin: Ludwig, on the other hand, maintained, that they were compoſed of the extremities of blood-veſſels and nerves; both theſe opinions are now deſervedly rejected.

They ſeem to poſſeſs many properties in common with the cuticle; like it they are neither vaſcular nor ſenſible, and when the cuticle is ſeparated from the true ſkin by maceration or other means, the nails come away with it.

They appear to be compoſed of different layers, of unequal ſize, applied one over the other. Each layer ſeems to be formed of longitudinal fibres.

In each nail we may diſtinguiſh three parts, viz. the root, the body or middle, and the extremity. The root is a ſoft, thin, and white ſubſtance, terminating in the form of a creſcent; the epidermis adheres very ſtrongly to this part; the body of the nail is broader, redder, and thicker, and the extremity is of ſtill greater firmneſs.

The nails increaſe from their roots, and not from their upper extremity.

Their principal uſe is to cover and defend the ends of the fingers and toes from external injury.

§ 7. *Of the* HAIR.

82 The hair.

THE hairs, which from their being generally known do not ſeem to require any definition, ariſe from diſtinct capſules or bulbs ſeated in the cellular membrane under the ſkin (Q). Some of theſe bulbs incloſe ſeveral hairs. They may be obſerved at the roots of the hairs which form the beard or whiſkers of a cat.

The hairs, like the nails, grow only from below by a regular propulſion from their root, where they receive their nouriſhment. Their bulbs, when viewed with a microſcope, are found to be of various ſhapes. In the head and ſcrotum they are roundiſh; in the eye-brows they are oval; in the other parts of the body they are nearly of a cylindrical ſhape. Each bulb ſeems to conſiſt of two membranes, between which there is a certain quantity of moiſture. Within the bulb the hair ſeparates into three or four fibrillæ; the bodies of the hairs, which are the parts without the ſkin, vary in ſoftneſs and colour according to the difference of climate, age, or temperament of body (R).

Their general uſe in the body does not ſeem to be abſolutely determined; but hairs in particular parts, as on the eye-brows and eye-lids, are deſtined for particular uſes, which will be mentioned when thoſe parts are deſcribed.

§ 8. *Of the* CELLULAR MEMBRANE *and* FAT.

83 Cellular membrane.

THE cellular membrane is found to inveſt the moſt minute fibres we are able to trace; ſo that by modern phyſiologiſts, it is very properly conſidered as the univerſal connecting medium of every part of the body.

It is compoſed of an infinite number of minute cells united together, and communicating with each other. The two diſeaſes peculiar to this membrane are proofs of ſuch a communication; for in the *emphyſema* all its cells are filled with air, and in the anaſarca they are univerſally diſtended with water. Beſides theſe proofs of communication from diſeaſe, a familiar inſtance of it may be obſerved amongſt butchers, who uſually puncture this membrane, and by inflating it with air add to the good appearance of their meat.

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and from his experiments, which were conducted with great induſtry and patience, he was led to determine what kinds of ſolid or liquid aliment increaſed or diminiſhed it. From theſe experiments he formed a ſyſtem, which he publiſhed at Venice in 1614, in the form of aphoriſms, under the title of "Ars de Medicina Statica."

(P) Minute chryſtals have been obſerved to ſhoot upon the cloaths of men who work in glaſs-houſes. *Haller Elem. Phyſ.*

(Q) Malpighi, and after him the celebrated Ruyſch, ſuppoſed the hairs to be continuations of nerves, being of opinion that they originated from the papillæ of the ſkin, which they conſidered as nervous; and as a corroborating proof of what they advanced, they argued the pain we feel in plucking them out; but later anatomiſts ſeem to have rejected this doctrine, and conſider the hairs as particular bodies, not ariſing from the papillæ (for in the parts where the papillæ abound moſt there are no hairs), but from bulbs or capſules, which are peculiar to them.

(R) The hairs differ likewiſe from each other, and may not be improperly divided into two claſſes; one of which may include the hair of the head, chin, pubes, and axillæ; and the other, the ſofter hairs, which are to be obſerved almoſt every where on the ſurface of the body.

184 Fat. The cells of this membrane ſerve as reſervoirs to the oily part of the blood or *Fat*, which ſeems to be depoſited in them, either by tranſudation through the coats of the arteries, that ramify through theſe cells, or by particular veſſels, continued from the end of arteries. Theſe cells are not of a glandular ſtructure, as Malpighi and others after him have ſuppoſed. The fat is abſorbed and carried back into the ſyſtem by the lymphatics. The great waſte of it in many diſeaſes, particularly in the conſumption, is a ſufficient proof that ſuch an abſorption takes place.

The fulneſs and ſize of the body are in a great meaſure proportioned to the quantity of fat contained in the cells of this membrane.

In the living body it ſeems to be a fluid oil, which concretes after death. In graminivorous animals, it is found to be of a firmer conſiſtence than in man.

The fat is not confined to the ſkin alone, being met with every where in the interſtices of muſcles, in the omentum, about the kidneys, at the baſis of the heart, in the orbits, &c.

The chief uſes of the fat ſeems to be to afford moiſture to all the parts with which it is connected; to facilitate the action of the muſcles; and to add to the beauty of the body, by making it every where ſmooth and equal.

85 SECT. II. *Of the* MUSCLES.

THE muſcles are the organs of motion. The parts that are uſually included under this name conſiſt of diſtinct portions of fleſh, ſuſceptible of contraction and relaxation; the motions of which, in a natural and healthy ſtate, are ſubject to the will, and for this reaſon they are called *voluntary* muſcles. But beſides theſe, there are other parts of the body that owe their power of contraction to their muſcular fibres; thus the heart is of a muſcular texture, forming what is called a *hollow* muſcle; and the urinary bladder, ſtomach, inteſtines, &c. are enabled to act upon their contents, merely becauſe they are provided with muſcular fibres. Theſe are called *involuntary* muſcles, becauſe their motions are not dependent on the will. The muſcles of reſpiration, being in ſome meaſure influenced by the will, are ſaid to have a *mixed* motion.

The names by which the voluntary muſcles are diſtinguiſhed, are founded on their ſize, figure, ſituation, uſe, or the arrangement of their fibres, or their origin and inſertion. But beſides theſe particular diſtinctions, there are certain general ones that require to be noticed. Thus, if the fibres of a muſcle are placed parallel to each other in a ſtraight direction, they form what is ſtyled a *rectilinear* muſcle; if the fibres croſs and interſect each other, they conſtitute a *compound* muſcle; a *radiated* one, if the fibres are diſpoſed in the manner of rays; or a *penniform* muſcle, if, like the plume of a pen, they are placed obliquely with reſpect to the tendon.

Muſcles that act in oppoſition to each other, are called *antagoniſtæ*; thus every extenſor or muſcle has a flexor for its antagoniſt, and *vice verſa*. Muſcles that concur in the ſame action are ſtyled *congeneres*.

The muſcles being attached to the bones, the latter may be conſidered as levers that are moved in different directions by the contraction of thoſe organs.

The end of a muſcle which adheres to the moſt fixed part is uſually called the *origin*, and that which adheres to the more moveable part, the *inſertion*, of the muſcle.

In every muſcle we may diſtinguiſh two kinds of fibres; the one ſoft, of a red colour, ſenſible, and irritable, called *fleſhy* fibres; the other of a firmer texture, of a white gliſtening colour, inſenſible, without irritability or the power of contracting, and named tendinous fibres. They are occaſionally intermixed; but the fleſhy fibres generally prevail in the belly or middle part of a muſcle, and the tendinous ones in the extremities. If theſe tendinous fibres are formed into a round ſlender chord, they form what is called the *tendon* of the muſcle; on the other hand, if they are ſpread into a broad flat ſurface, the extremity of the muſcle is ſtyled *aponeuroſis*.

The tendons of many muſcles, eſpecially when they are long and expoſed to preſſure or friction in the grooves formed for them in the bones, are ſurrounded by a tendinous ſheath or *faſcia*, in which we ſometimes find a ſmall mucous ſac or *burſa mucoſa*, which obviates any inconvenience from friction. Sometimes we find whole muſcles, and even ſeveral muſcles, covered by a faſcia of the ſame kind, that affords origin to many of their fibres, dipping down between them, adhering to the ridges of bones, and thus preventing them from ſwelling too much when in action. The moſt remarkable inſtance of ſuch a covering is the *faſcia lata* of the thigh.

Each muſcle is incloſed by a thin covering of cellular membrane, which has been ſometimes improperly conſidered as peculiar to the muſcles, and deſcribed under the name of *propria membrana muſculoſa*. This cellular covering dips down into the ſubſtance of the muſcle, connecting and ſurrounding the moſt minute fibres we are able to demonſtrate, and affording a ſupport to their veſſels and nerves.

Lieuwhenhoeck fancied he had diſcovered, by means of his microſcope, the ultimate diviſion of a muſcle, and that he could point out the ſimple fibre, which appeared to him to be an hundred times leſs than a hair; but he was afterwards convinced how much he was miſtaken on this ſubject, and candidly acknowledged, that what he had taken for a ſimple fibre was in fact a bundle of fibres.

It is eaſy to obſerve ſeveral of theſe faſciculi or bundles in a piece of beef, in which, from the coarſeneſs of its texture, they are very evident.

The red colour which ſo particularly diſtinguiſhes the muſcular or fleſhy parts of animals, is owing to an infinite number of blood-veſſels that are diſperſed through their ſubſtance. When we macerate the fibres of a muſcle in water, it becomes of a white colour like all other parts of the body diveſted of their blood. The blood-veſſels are accompanied by nerves, and they are both diſtributed in ſuch abundance to theſe parts, that in endeavouring to trace the courſe of the blood-veſſels in a muſcle, it would appear to be formed altogether by their ramifications; and in an attempt to follow the branches of its nerves, they would be found to be equal in proportion.

If a muſcle is pricked or irritated, it immediately contracts. This is called its irritable principle; and this irritability is to be conſidered as the characteriſtic of muſcular fibres, and may ſerve to prove their exiſtence in parts that are too minute to be examined by the eye. This power, which diſpoſes the muſcles to contract when ſtimulated, independent of the will, is ſuppoſed to be inherent in them; and is therefore named *vis inſita*. This property is not to be confounded with elaſticity, which the membranes and other parts of the body poſſeſs in a greater or leſs degree in common with the muſcles; nor with ſenſibility, for the heart, though the moſt irritable, ſeems to be the leaſt ſenſible of any of the muſcular parts of the body.

86 Of the vis inſita.

After a muſcular fibre has contracted, it ſoon returns to a ſtate of relaxation, till it is excited afreſh, and then it contracts and relaxes again. We may likewiſe produce ſuch a contraction, by irritating the nerve leading to a muſcle, although the nerve itſelf is not affected.

This principle is found to be greater in ſmall than in large, and in young than in old, animals.

In the voluntary muſcles theſe effects of contraction and relaxation of the fleſhy fibres are produced in obedience to the will, by what may be called the *vis nervoſa*, a property that is not to be confounded with the *vis inſita*. As the exiſtence of a *vis inſita* different from a *vis nervea*, was the doctrine taught by Doctor Haller in his *Elem. Phyſ.* but is at preſent called in queſtion by ſeveral, particularly Doctor Monro, we think it neceſſary to give a few objections, as ſtated in his Obſervations on the Nervous Syſtem:

87 The vis nervea.

“ The chief experiment (ſays the Doctor) which ſeems to have led Dr Haller to this opinion, is the well-known one, that the heart and other muſcles, after being detached from the brain, continue to act ſpontaneouſly, or by ſtimuli may be rouſed into action for a conſiderable length of time; and when it cannot be alledged, ſays Dr Haller, that the nervous fluid is by the mind, or otherwiſe, impelled into the muſcle.

“ That in this inſtance, we cannot comprehend by what power the nervous fluid or energy can be put in motion, muſt perhaps be granted: But has Dr Haller given a better explanation of the manner in which his ſuppoſed vis inſita becomes active?

“ If it be as difficult to point out the cauſe of the action of the vis inſita as that of the action of the vis nervea, the admiſſion of that new power, inſtead of relieving, would add to our perplexity.

“ We ſhould then have admitted, that two cauſes of a different nature were capable of producing exactly the ſame effect; which is not in general agreeable to the laws of nature.

“ We ſhould find other conſequences ariſe from ſuch an hypotheſis, which tend to weaken the credibility of it. For inſtance, if in a ſound animal the vis nervea alone produces the contraction of the muſcles, we will aſk what purpoſe the vis inſita ſerves? If both operate, are we to ſuppoſe that the vis nervea, impelled by the mind or living principle, gives the order, which the vis inſita executes, and that the nerves are the internuntii; and ſo admit two wiſe agents employed in every the moſt ſimple action? But inſtead of ſpeculating farther, let us learn the effect of experiments, and endeavour from theſe to draw plain concluſions.

“ 1. When I poured a ſolution of opium in water under the ſkin of the leg of a frog, the muſcles, to the ſurface of which it was applied, were very ſoon deprived of the power of contraction. In like manner, when I poured this ſolution into the cavity of the heart, by opening the vena cava, the heart was almoſt inſtantly deprived of its power of motion, whether the experiment was performed on it fixed in its place, or cut out of the body.

“ 2. I opened the thorax of a living frog; and then tied or cut its aorta, ſo as to put a ſtop to the circulation of its blood.

“ I then opened the vena cava, and poured the ſolution of opium into the heart; and found, not only that this organ was inſtantly deprived of its powers of action, but that in a few minutes the moſt diſtant muſcles of the limbs were extremely weakened. Yet this weakneſs was not owing to the want of circulation, for the frog could jump about for more than an hour after the heart was cut out.

“ In the firſt of theſe two experiments, we obſerved the ſuppoſed vis inſita deſtroyed by the opium; in the latter, the vis nervea; for it is evident that the limbs were affected by the ſympathy of the brain, and of the nervous ſyſtem in general, with the nerves of the heart.

“ 3. When the nerve of any muſcle is firſt divided by a tranſverſe ſection, and then burnt with a hot iron, or punctured with a needle, the muſcle in which it terminates contracts violently, exactly in the ſame manner as when the irritation is applied to the fibres of the muſcle. But when the hot iron, or needle, is confined to the nerve, Dr Haller himſelf muſt have admitted, that the vis nervea, and not the vis inſita, was excited. But here I would aſk two queſtions.

“ Firſt, Whether we do not as well underſtand how the vis nervea is excited when irritation is applied to the muſcle as when it is applied to the trunk of the nerve, the impelling power of the mind ſeeming to be equally wanting in both caſes?

“ Secondly, If it appears that irritation applied to the trunk of a nerve excites the vis nervea, why ſhould we doubt that it can equally well excite it when applied to the ſmall and very ſenſible branches and terminations of the nerve in the muſcle?

“ As, therefore, it appears that the ſuppoſed vis inſita is deſtroyed or excited by the ſame means as the vis nervea; nay, that when, by the application of opium to the heart of a frog, after the aorta is cut and the circulation interrupted, we have deſtroyed the vis inſita, the vis nervea is ſo much extinguiſhed, that the animal cannot act with the diſtant muſcles of the limb; and that theſe afterward grow very torpid, or loſe much of their ſuppoſed vis inſita; it ſeems clearly to follow, that there is no juſt ground for ſuppoſing that any other principle produces the contraction of a muſcle.”

The *vis nervoſa*, or operation of the mind, if we may ſo call it, by which a muſcle is brought into contraction, is not inherent in the muſcle like the *vis inſita*; neither is it perpetual, like this latter property. After long continued or violent exerciſe, for example, the voluntary muſcles become painful, and at length incapable of further action; whereas the heart and other involuntary muſcles, the motions of which depend ſolely on the *vis inſita*, continue through life in a conſtant ſtate of action, without any inconvenience or waſte of this inherent principle.

The action of the vis nervoſa on the voluntary muſcles, conſtitutes what is called *muſcular motion*; a ſubject that has given riſe to a variety of hypotheſes, many of them ingenious, but none of them ſatisfactory.

Borelli and ſome others have undertaken to explain the cauſe of contraction, by ſuppoſing that every muſcular fibre forms as it were a chain of very minute bladders, while the nerves which are diſtributed through the muſcle, bring with them a ſupply of animal ſpirits, which at our will fill theſe bladders, and by increaſing their diameter in width, ſhorten them, and of courſe the whole fibre.

Borelli ſuppoſes theſe bladders to be of a rhomboidal ſhape; Bernouilli on the other hand contends that they are oval. Our countryman, Cowper, fancied he had filled them with mercury; the cauſe of this miſtake was probably owing to the mercury's inſinuating itſelf into ſome of the lymphatic veſſels. The late ingenious Mr Elliot undertook to account for the phenomena of muſcular motion on principles very different from thoſe juſt now mentioned. He ſuppoſed that a dephlogiſticated ſtate of the blood is requiſite for muſcular action, and that a communication of phlogiſton to the blood is a neceſſary effect of ſuch action.

We know that the muſcular fibre is ſhortened, and that the muſcle itſelf ſwells when in action; but how theſe phenomena are produced, we are unable to determine. We likewiſe know that the nerves are eſſential to muſcular motion; for upon dividing or making a ligature round the nerve leading to a muſcle, the latter becomes incapable of motion. A ligature made on the artery of a muſcle produces a ſimilar effect; a proof this, that a regular ſupply of blood is alſo equally neceſſary to muſcular motion. The cauſe of palſy is uſually not to be ſought for in the muſcle affected, but in the nerve leading to that muſcle, or in that part of the brain of ſpinal marrow from which the nerve derives its origin.

Of the particular Muſcles.

As the enumeration and deſcription of the particular muſcles muſt be dry and unentertaining to the generality of readers, yet cannot be altogether omitted in a work of this nature, it appeared eligible to throw this part of the ſubject into the form of a table; in which the name, origin, inſertion, and principal uſe of each muſcle, will be found deſcribed in few words, and occaſionally its etymology when it is of Greek derivation or difficult to be underſtood.

A TABLE of the MUSCLES, arranged according to their SITUATION.

[*N. B.* This table does not include all the muſcles of the body; thoſe belonging to the eyes, internal ear, inteſtinum rectum, and the male and female organs of generation, being deſcribed in other parts of the work. The reader will be pleaſed to obſerve likewiſe, that although all the muſcles (a few only excepted) are in pairs, mention is here made only of the muſcles of one ſide.]

MUSCLES ſituated	*Name.*	*Origin.*	*Inſertion.*	*Uſe.*
under the integuments of the cranium - - -	1. Occipito frontalis.	From the tranſverſe ridge of the os occipitis.	Into the ſkin of the eye-brows.	To pull the ſkin of the head backwards, and to raiſe the eye-brows and ſkin of the forehead.
	2. Corrugator ſupercilii.	From above the joining of the os frontis, os naſi, and os maxillare.	Into the inner part of the occipito-frontalis.	To draw the eye-brows towards each other, and to wrinkle the forehead.
———— of the eye-lids -	1. Orbicularis palpebrarum.	From around the edge of the orbit.	Into the naſal proceſs of the os maxillare.	To ſhut the eye.
	2. Levator palpebræ ſuperioris.	From the bottom of the orbit, near the optic foramen.	Into the cartilage of the upper eye-lid.	To open the eye.
———— of the external ear -	1. Attolens auriculam.	From the tendon of the occipito frontalis near the os temporis.	Into the upper part of the ear.	To raiſe the ear.
	2. Anterior auriculæ.	From near the back part of the zygoma.	Into an eminence behind the helix.	To raiſe this eminence, and to pull it forwards.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	3. Retrahentes (s) auriculæ.	From the outer and back part of the root of the maſtoid proceſs.	Into the convex part of the concha.	To ſtretch the concha, and pull the ear backwards.
MUSCLES of the cartilages of the ear	1. Tragicus.	From the outer and middle part of the concha, near the tragus.	Into the upper part of the tragus.	To depreſs the concha, and pull the point of the tragus a little outwards.
	2. Anti-tragicus.	From the root of the inner part of the helix.	Into the upper part of the anti-tragus.	To dilate the mouth of the concha.
	3. Tranſverſus-auriculæ.	From the upper part of the concha.	Into the inner part of the helix.	To ſtretch the concha and ſcapha, and likewiſe to pull the parts it is connected with towards each other.
	4. Helicis major.	From the upper, anterior, and acute part of the helix.	Into the cartilage of the helix, a little above the tragus.	To depreſs the upper part of the helix.
	5. Helicis minor.	From the lower and fore part of the helix.	Into the helix, near the fiſſure in its cartilage.	To contract the fiſſure.
——— of the noſe,	1. Compreſſor (t) naris.	From the outer part of the root of the ala naſi.	Into the naſal proceſs of the os maxillare, and anterior extremity of the os naſi.	To ſtraighten the noſtrils, and likewiſe to corrugate the ſkin of the noſe.
——— of the mouth and lips, -	1. Levator labii ſuperioris, alæque naſi.	From the outer part of the orbitar proceſs of the os maxillare, and from the naſal proceſs of that bone, where it joins the os frontis.	Into the upper lip and ala of the noſe.	To draw the upper lip and ſkin of the noſe upwards and outwards.
	2. Levator anguli oris.	From the os maxillare ſuperius, between the orbitar foramen and the firſt dens molares.	Into the orbicularis oris at the angle of the mouth.	To raiſe the corner of the mouth
	3. Zygomaticus major.	From the os malæ near the zygomatic ſuture.	Into the angle of the mouth.	To raiſe the angle of the mouth, and make the cheek prominent, as in laughing.
	4. Zygomaticus minor.	Immediately above the origin of the zyg. major.	Into the angle of the mouth.	To raiſe the angle of the mouth obliquely outwards.
	5. Buccinator.	From the alveoli of the dentes molares in the upper and lower jaws.	Into the angle of the mouth.	To contract the mouth and draw the angle of it outwards and backwards.
	6. Depreſſor labii ſuperioris, alæque naſi.	From the os maxill. ſuper. immediately above the gums of the dentes inciſores.	Into the root of the ala naſi and upper lip.	To draw the ala naſi and upper lip downwards.

(s) Theſe are three ſmall ſlender muſcles. The inferior one is ſometimes wanting.

(t) The noſe is affected by fibres of the occipito frontalis, and by ſeveral muſcles of the face; but this pair, the compreſſores, is the only one that is proper to it.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	7. Depreſſor anguli oris.	At the ſide of the chin from the lower edge of the maxilla inferior.	Into the angle of the mouth.	To draw the corner of the mouth downwards.
	8. Depreſſor labii inferioris.	From the lower and anterior part of the maxilla inferior.	Into the under lip.	To draw the under lip downwards and ſomewhat outwards
	9. Levator labii inferioris.	From near the gums of the inciſores and caninus of the maxilla inferior.	Into the under lip and ſkin of the chin.	To raiſe the under lip and ſkin of the chin.
	10. Orbicularis Oris (u).			To ſhut the mouth by conſtraining the lips.
MUSCLES of the lower jaw, - -	1. Temporalis.	From part of the os bregmatis and os frontis; ſquamous part of the os temporis; back part of the os malæ, and the temporal proceſs of the os ſphenoides (v)	Into the coronoid proceſs of the lower jaw.	To move the lower jaw upwards.
	2. Maſſeter (w).	From the malar proceſs of the os maxillare, and the lower edges of the os malæ, and of the zygomatic proceſs of the os temporis.	Into the baſis of the coronoid proceſs, and that part of the jaw which ſupports that and the condyloid proceſs.	To raiſe and likewiſe to move the jaw a little forwards and backwards.
	3. Pterygoideus internus.	From the inner ſurface of the outer wing of the pterygoid proceſs of the os ſphenoides, and from the proceſs of the os palati that helps to form the pterygoid foſſa	Into the lower jaw on its inner ſide and near its angle.	To raiſe the lower jaw and draw it a little to one ſide.
	4. Pterygoideus externus.	From the external ala of the pterygoid proceſs, a ſmall part of the adjacent os maxillare, and a ridge in the temporal proceſs of the os ſphenoides.	Into the fore part of the condyloid proceſs of the lower jaw, and likewiſe of the capſular ligament.	To move the jaw forwards and to the oppoſite ſide (x); and at the ſame time to prevent the ligament of the joint from being pinched.
——— ſituated at the fore part of the neck. - -	1. Latiſſimus colli (y).	From the cellular membrane covering	Into the ſide of the chin and integu-	To draw the cheeks and ſkin of the face

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(u) This muſcle is, in a great meaſure, if not wholly, formed by the buccinator, zygomatici, depreſſores, and other muſcles that move the lips. Its fibres ſurround the mouth like a ring.

(v) Some of its fibres likewiſe have their origin from a ſtrong faſcia that covers the muſcle and adheres to the bone round the whole circumference of its origin. When we remove this covering, we find the muſcle of a ſemicircular ſhape with its fibres, converging and forming a ſtrong middle tendon.

(w) So called from its uſe in chewing, its derivation being from *μασισαομαι*, *manduco*, "to eat."

(x) This happens when the muſcle acts ſingly. When both act, the jaw is brought horizontally forwards.

(y) This broad and thin muſcular expanſion, which is ſituated immediately under the common integuments, is by Winſlow named *muſculus cutaneus*. Galen gave it the name of *ϖλατυσμα μυωδης* (*Platyſma-myoides*); the etymology of which is from *ϖλατυσμος*, *dilatatio*, and *μυς*, *muſculus*, and *ειδος*, *forma*.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
		the pectoral, deltoid, and trapezius muſcles.	ments of the cheek.	downwards; and when the mouth is ſhut, to draw all that part of the ſkin to which it is connected below the lower jaw upwards.
	2. Maſtoideus (z).	From the upper part of the ſternum, and from the upper and fore part of the clavicle.	Into the maſtoid proceſs, and as far back as the lambdoidal ſuture.	To move the head to one ſide, or when both muſcles act, to bend it forwards.
MUSCLES ſituated between the trunk and the os hyoides.	1. Omo-hyoideus (A).	From the upper coſta of the ſcapula near its niche; from part of a ligament that extends acroſs this niche, and ſometimes by a few fibres, from the coracoid proceſs.	Into the baſis of the os hyoides.	To draw the os hyoides in an oblique direction downwards.
	2. Sterno-hyoideus.	From the cartilage of the firſt rib, the inner and upper part of the ſternum, and a ſmall part of the clavicle.	Into the baſis of the os hyoides.	To draw the os hyoides downwards.
	3. Hyo-thyroideus.	From part of the baſis and horn of the os hyoides.	Into a rough oblique line at the ſide of the thyroid cartilage.	To raiſe the thyroid cartilage, or depreſs the os hyoides
	4. Sterno-thyroideus.	From between the cartilages of the 1ſt and 2d ribs at the upper and inner part of the ſternum.	Immediately under the hyo-thyroideus.	To pull the thyroid cartilage downwards.
	5. Crico-thyroideus.	From the anterior part and ſide of the cricoid cartilage.	Into the lower part and inferior horn of the thyroid cartilage.	To pull the cricoid cartilage upwards and backwards, or the thyroid forwards and downwards.
——ſituated between the os hyoides and lower jaw,	1. Diagraſticus (B).	From a foſſa at the root of the maſtoid proceſs, and likewiſe from the os hyoides.	Into the lower and anterior part of the chin.	To draw the lower jaw downwards.
	2. Stylo-hyoideus (c).	From the baſis of the ſtyloid proceſs.	Into the ſide and fore part of the os hyoides near its baſe.	To draw the os hyoides obliquely upwards.

(z) This, on account of its two origins, is by Albinus deſcribed as two diſtinct muſcles, which he names *ſterno-maſtoideus* and *cleido-maſtoideus*.

(A) This muſcle does not always ariſe from the coracoid proceſs, it ſeems to have been improperly named *coraco-hyoides* by Douglas and Albinus. Winſlow calls it *omo-hyoideus*, on account of its general origin from the ſcapula.

(B) From δις and γαστηρ *(biventer)*, becauſe it has two fleſhy bellies with a middle tendon. This tendon paſſes through the ſtylo-hyoideus.

(c) In ſome ſubjects we meet with another muſcle, which from its having nearly the ſame origin, inſertion, and uſe as this, has been named *ſtylo-hyoideus alter*.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	3. Mylo-hyoideus (D).	From the inſide of the lower jaw, between the laſt dens molaris and the chin.	Into the baſis of the os hyoides.	To move the os hyoides to either ſide, forwards or upwards.
	4. (E) Geno-hyoideus.	From the inſide of the chin.	Into the baſe of the os hyoides.	To move the os hyoides forwards or upwards.
	5. Genio-gloſſus.	From the inſide of the chin.	Into the tongue and baſis of the os hyoides.	To move the tongue in various directions.
	6. Hyo-gloſſus (F).	From the horn, baſis, and appendix of the os hyoides.	Into the tongue laterally.	To draw the tongue downwards and inwards.
	7. Lingualis.	Laterally from the root of the tongue.	Into the extremity of the tongue.	To ſhorten the tongue and draw it backwards.
	8. Stylo-gloſſus.	From the ſtyloid proceſs, and ſometimes alſo from a ligament that extends from thence to the angle of the lower jaw.	Into the ſide of the tongue from the root to near its tip.	To move the tongue backwards and to one ſide.
	9. Stylo-pharyngæus.	From the baſis of the ſtyloid proceſs.	Into the ſide of the pharynx and poſterior part of the thyroid cartilage.	To raiſe the thyroid cartilage and pharynx, and likewiſe to dilate the latter.
	10. Circumflexus-palati.	From near the bony part of the Euſtachian tube, and from the ſpinous proceſs of the os ſphenoides.	Into the ſemilunar edge of the os palati and the velum pendulum palati (G).	To dilate and draw the velum obliquely downwards.
	11. Levator palati.	From the membranous part of the Euſtachian tube, and the extremity of the os petroſum.	Into the velum pendulum palati.	To pull the velum backwards.
Muscles ſituated about the fauces,	1. Palato-pharyngæus.	From the lower and anterior part of the cartilaginous extremity of the Euſtachian tube (H); the tendinous expanſion of the circumflexus palati; and the velum pendulum palati near the baſis and back part of the uvula.	Into the upper and poſterior part of the thyroid cartilage.	To raiſe the pharynx and thyroid cartilage, or to pull the velum and uvula backwards and downwards.

2. Conſtrictor

(D) So named from its ariſing near the dentes molares (μυλοι), and its being inſerted into the os hyoides.

(E) From γενειον, *mentum*, the "chin."

(F) From κερας, *cornu*, and γλωσσα, *lingua*, "the tongue."

(G) This muſcle in its courſe forms a round tendon, which, after croſſing over a kind of hook formed by the inner plate of the pterygoid proceſs of the ſphenoid bone, expands into a tendinous membrane.

(H) The few fibres that ariſe from the Euſtachian tube are deſcribed as a diſtinct muſcle by Albinus, under the name of *ſalpingo pharyngeus*. They ſerve to dilate the mouth of the tube.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	2. Conſtrictor iſthmi faucium.	From near the baſis of the tongue laterally.	Into the velum pendulum palati, near the baſis and fore part of the uvula.	To raiſe the tongue and draw the velum towards it (I).
	3. Azygos uvulæ.	From the end of the ſuture that unites the oſſa palati.	Into the extremity of the uvula.	To ſhorten the uvula, and bring it forwards and upwards.
Muscles at the back part of the pharynx	1. Conſtrictor pharyngis ſuperior.	From the cuneiform proceſs of the occipital bone; the pterygoid proceſs of the os ſphenoides, and from each jaw near the laſt dens molares (K).	Into the middle of the pharynx.	To move the pharynx upwards and forwards, and to compreſs its upper part.
	2. Conſtrictor pharyngis medius (L).	From the horn and appendix of the os hyoides, and from the ligament that unites it with the thyroid cartilage.	Into the middle of the proceſſus cuneiformis of the occipital bone, about its middle and before the great foramen.	To draw the os hyoides and pharynx upwards, and to compreſs the latter.
	3. Conſtrictor pharyngis inferior (M).	From the cricoid and thyroid cartilages.	Into the middle of the pharynx.	To compreſs part of the pharynx.
——— about the glottis - - -	1. Crico-arytænoideus lateralis.	From the ſide of the cricoid cartilage.	Into the baſis of the arytænoid cartilage laterally.	To open the glottis.
	2. Crico-arytænoideus poſticus.	From the cricoid cartilage poſteriorly.	Into the baſis of the arytænoid cartilage poſteriorly.	To open the glottis.
	3. Arytænoideus obliquis.	From the baſis of one of the arytænoid cartilages.	Near the extremity of the other arytænoid cartilage.	To draw the parts it is connected with towards each other.
	4. Arytænoideus tranſverſus.	From one of the arytænoid cartilages laterally.	Into the other arytænoid cartilage laterally.	To ſhut the glottis.
	5. Thyreo-arytænoideus.	From the poſterior and under part of the thyroid cartilage.	Into the arytænoid cartilage.	To draw the arytænoid cartilage forwards.
	6. Arytæno-epiglottideus.	From the upper part of the arytænoid cartilage laterally.	Into the ſide of the epiglottis.	To move the epiglottis outwards.
	7. Thyreo-epiglottideus.	From the thyroid cartilage.	Into the ſide of the epiglottis.	To pull the epiglottis obliquely downwards (N.)

Muſcles

(I) This muſcle, and the palato-pharyngæus, likewiſe ſerve to cloſe the paſſage into the fauces, and to carry the food into the pharynx.

(K) The three orders of fibres here mentioned, with a few others derived from the tongue, have given occaſion to Douglas to deſcribe them as four diſtinct muſcles, under the names of *cephalo-pharyngæus*, *mylo-pharyngæus*, *pterygo-pharyngæus*, and *gloſſo-pharyngæus*.

(L) Douglas makes two muſcles of this, the *hyo-pharyngæus* and *ſyndeſmo-pharyngæus*.

(M) The crico-pharyngæus and thyro-pharyngæus of Douglas.

(N) When either this or the preceding muſcle acts with its fellow, the epiglottis is drawn directly downwards upon the glottis.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
MUSCLES at the fore part of the neck, cloſe to the vertebræ - - - -	1. Rectus capitis internus major.	From the anterior extremities of the tranſverſe proceſſes of the five lowermoſt cervical vertebræ.	Into the fore part of the cuneiform proceſs of the os occipitis.	To bend the head forwards.
	2. Rectus capitis internus minor.	From the anterior and upper part of the firſt cervical vertebra.	Near the baſis of the condyloid proceſs of the os occipitis.	To aſſiſt the laſt deſcribed muſcle.
	3. Rectus capitis lateralis.	From the anterior and upper part of the tranſverſe proceſs of the firſt cervical vertebra.	Into the os occipitis, oppoſite to the ſtylo-maſtoid foramen.	To move the head to one ſide.
	4. Longus colli.	Within the thorax, laterally from the bodies of the three uppermoſt dorſal vertebræ; from the baſis and fore part of the tranſverſe proceſſes of the firſt and ſecond dorſal vertebræ, and of the laſt cervical vertebra; and laſtly, from the anterior extremities of the tranſverſe proceſſes of the 6th, 5th, 4th, and 3d cervical vertebræ.	Into the ſecond cervical vertebra anteriorly.	To pull the neck to one ſide (o).
———at the fore part of the abdomen - - - -	1. Obliquus externus.	From the lower edges of the eight inferior ribs, near their cartilages.	Into the linea alba (p), oſſa pubis (q), and ſpine of the ilium (r).	To compreſs and ſupport the viſcera, aſſiſt in evacuating the fæces and urine, draw down the ribs, and bend the trunk forwards, or obliquely to one ſide.
	2. Obliquus internus.	From the ſpinous proceſs of the three lowermoſt lumbar	Into the cartilages of all the falſe ribs, linea alba (s), and	To aſſiſt the obliquus externus.

(o) When both muſcles act, the neck is drawn directly forwards.

(p) The linea alba is that tendinous expanſion which reaches from the cartilago enſiformis to the os pubis. It is formed by the interlacement of the tendinous fibres of the oblique and tranſverſe muſcles, and on this account ſome anatomiſts have conſidered theſe as three digaſtric muſcles.

(q) A little above the pubis the tendinous fibres of this muſcle ſeparate from each other, ſo as to form an opening called the *ring* of the obliquus externus, and commonly, though improperly, the ring of the abdominal muſcles, there being no ſuch aperture either in the tranſverſalis or obliquus internus. This ring in the male ſubject affords a paſſage to the ſpermatic veſſels, and in the female to the round ligament of the uterus.

(r) From the anterior and upper ſpinous proceſs of the ilium, this muſcle is ſtretched tendinous to the os pubis, and thus forms what is called by ſome *Fallopius's*, and by others *Poupart's ligament*. The blood-veſſels paſs under it to the thigh.

(s) The tendon formed by the upper part of this muſcle in its way to the linea alba is divided into two layers. The poſterior layer runs under, and the anterior one over, the rectus muſcle.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
		vertebræ, the back part of the os ſacrum, the ſpine of the ilium, and back part of Fallopius's ligament (T).	fore part of the pubis.	
	3. Tranſverſalis.	From the cartilages of the ſeven inferior ribs; the tranſverſe proceſſes of the laſt dorſal, and four upper lumbar vertebræ; the inner part of Fallopius's ligament and the ſpine of the ilium.	Into the linea alba and cartilago enſiformis.	To compreſs the abdominal viſcera.
	4. Rectus abdominis.	From the upper edge of the pubis and the ſymphyſis pubis.	Into the cartilages of the 5th, 6th, and 7th ribs, and the edge of the cartilago enſiformis (U).	To compreſs the fore part of the abdomen, and to bend the trunk forwards.
	5. Pyramidalis (V).	From the anterior and upper part of the pubis.	Into the linea alba and inner edge of the rectus, commonly about two inches above the pubis.	To aſſiſt the lower portion of the rectus.
MUSCLES at the fore part of the thorax -	1. Pectoralis Major.	From the cartilaginous ends of the 5th and 6th ribs; the ſternum, and anterior part of the clavicle.	Into the upper and inner part of the os humeri (W).	To draw the arm forwards, or obliquely forwards.
	2. Subclavius.	From the cartilage of the firſt rib.	Into the under ſurface of the clavicle.	To move the clavicle forwards and downwards, and to aſſiſt in raiſing the firſt rib.
	3. Pectoralis minor (X).	From the upper edges of the 3d, 4th, and 5th ribs.	Into the coracoid proceſs of the ſcapula.	To move the ſcapula forwards and downwards, or to elevate the ribs.
	4. Serratus Magnus.	From the eight ſuperior ribs.	Into the baſis of the ſcapula.	To bring the ſcapula forwards.

MUSCLES

(T) From this part it detaches ſome fibres which extend downwards upon the ſpermatic chord, and form what is deſcribed as the cremaſter muſcle.

(U) The fibres of the rectus are generally divided by three tendinous interſections. The two upper thirds of this muſcle paſſing between the tendinous layers of the obliquus internus, are incloſed as it were in a ſheath; but at its lower part we find it immediately contiguous to the peritonæum, the inferior portion of the tendon of the tranſverſalis paſſing over the rectus, and adhering to the anterior layer of the obliquus internus.

(V) This muſcle is ſometimes wanting.

(W) The fibres of this muſcle paſs towards the axilla in a folding manner, and with thoſe of the latiſſimus dorſi from the arm-pit.

(X) This and ſome other muſcles derive their name of *ſerratus*, from their ariſing by a number of tendinous or fleſhy digitations, reſembling the teeth of a ſaw (*ſerra*).

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
MUSCLES that concur in forming the thorax, - -	1. Diaphragma (Y).			
	2. Levatores coſtarum.	From the tranſverſe proceſſes of the laſt cervical and the eleven upper dorſal vertebræ.	Into the upper ſide of each rib, near its tuberoſity.	To move the ribs upwards and outwards.
	3. Intercoſtales externi.	From the lower edge of each upper rib.	Into the ſuperior edge of each lower rib.	To elevate the ribs.
	4. Intercoſtales interni (A).			
	5. Sterno-coſtales (B).	From the cartilago enſiformis, and lower and middle part of the ſternum.	Into the cartilages of the 2d, 3d, 4th, 5th, and 6th ribs.	To depreſs the cartilages of the ribs.
—— at the back part of the neck and trunk, - -	1. Trapezius (C), or cucullaris.	From the middle of the os occipitis, and the ſpinous proceſſes of the two inferior cervical, and of all the dorſal, vertebræ (D).	Into the poſterior half of the clavicle, part of the acromion, and the ſpine of the ſcapula.	To move the ſcapula.
	2. Rhomboideus (E).	From the ſpinous proceſſes of the three lowermoſt cervical, and of all the dorſal vertebræ.	Into the baſis of the ſcapula.	To move the ſcapula upwards and backwards.
	3 Latiſſimus dorſi.	From part of the ſpine of the os ilium, the ſpinous proceſſes of the os ſacrum and lumbar vertebræ, and of ſix or eight of the dorſal	Into the os humeri, at the inner edge of the groove for lodging the long head of the biceps muſcle.	To draw the os humeri downwards and backwards, and to roll it upon its axis.

(Y) For a deſcription of the diaphragm, ſee Part IV. Sect. IV.

(A) The origin, inſertion, and uſe of the internal intercoſtals, are ſimilar to thoſe of the external. The reader, however, will be pleaſed to obſerve, that the intercoſtales externi occupy the ſpaces between the ribs only from the ſpine to their cartilages; from thence to the ſternum, there being only a thin membrane, which is ſpread over the intercoſtales interni; and the latter, on the contrary, extend only from the ſternum to the angles of each rib.

The fibres of the external muſcles run obliquely forwards; thoſe of the internal obliquely backwards. This difference in the direction of their fibres induced Galen to ſuppoſe that they were intended for different uſes; that the external intercoſtals, for inſtance, ſerve to elevate, and the internal ones to depreſs the ribs. Fallopius ſeems to have been the firſt who ventured to diſpute the truth of this doctrine, which has ſince been revived by Boyle, and more lately ſtill by Hamberger, whoſe theoretical arguments on this ſubject have been clearly refuted by the experiments of Haller.

(B) Theſe conſiſt of four, and ſometimes five diſtinct muſcles on each ſide. Veſalius, and after him Douglas and Albinus, conſider them as forming a ſingle muſcle, which, on account of its ſhape, they name *triangularis.* Verheyen, Winſlow, and Haller, more properly deſcribe them as ſo many ſeparate muſcles, which, on account of their origin and inſertion, they name *ſterno-coſtales.*

(C) So named by Riolanus, from *τραπεζα*, on account of its quadrilateral ſhape. Columbus and others gave it the name of *cucullaris*, from its reſemblance to a monk's hood.

(D) The tendinous fibres of this muſcle, united with thoſe of its fellow in the nape of the neck, form what is called the *ligamentum colli.*

(E) This muſcle conſiſts of two diſtinct portions, which are deſcribed as ſeparate muſcles by Albinus, under the names of *rhomboideus minor* and *rhomboideus major.*

Name.	*Origin.*	*Inſertion.*	*Uſe*
	ſal vertebræ; alſo from the four inferior falſe ribs near their cartilages.		
4. Serratus inferior poſticus.	From the ſpinous proceſſes of the two lowermoſt dorſal, and of three of the lumbar vertebræ.	Into the lower edges of the three or four lowermoſt ribs near their cartilages.	To draw the ribs outwards, downwards, and backwards.
5. Levator ſcapulæ.	From the tranſverſe proceſſes of the four uppermoſt vertebræ colli.	Into the upper angle of the ſcapula.	To move the ſcapula forwards and upwards.
6. Serratus ſuperior poſticus.	From the lower part of the ligamentum colli, the ſpinous proceſs of the lowermoſt cervical vertebra, and of the two ſuperior dorſal vertebræ.	Into the 2d, 3d, and 4th ribs.	To expand the thorax.
7. Splenius (F).	From the ſpinous proceſſes of the four or five uppermoſt vertebræ of the back, and of the lowermoſt cervical vertebra.	Into the tranſverſe proceſſes of the two firſt cervical vertebræ, the upper and back part of the maſtoid proceſs, and a ridge on the os occipitis.	To move the head backwards.
8. Complexus (G).	From the tranſverſe proceſſes of the four or five uppermoſt dorſal, and of the ſix lowermoſt cervical vertebræ.	Into the os occipitis.	To draw the head backwards.
9. Trachelo-maſtoideus (H).	From the tranſverſe proceſſes of the firſt dorſal vertebra, and four or five of the lowermoſt, cervical vertebræ.	Into the maſtoid proceſs.	To draw the head backwards.
10. Rectus capitis poſticus major.	From the ſpinous proceſs of the ſecond cervical vertebra.	Into the os occipitis.	To extend the head and draw it backwards.
11. Rectus capitis poſticus minor.	From the firſt vertebra of the neck.	Into the os occipitis.	To aſſiſt the rectus major.
12. Obliquus ſuperior capitis.	From the tranſverſe proceſs of the firſt cervical vertebra.	Into the os occipitis.	To draw the head backwards.
13. Obliquus inferior capitis.	From the ſpinous proceſs of the ſecond cervical vertebra.	Into the tranſverſe proceſs of the firſt cervical vertebra.	To draw the face towards the ſhoulder, and to move the firſt vertebra upon the ſecond.

(F) According to ſome writers, this muſcle has gotten its name from its reſemblance to the ſpleen; others derive it from *ſplenium ſplint.*

(G) So named on account of its complicated ſtricture.

(H) So named from its origin from the neck (τραιχηλοις) and its inſertion into the maſtoid proceſs.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
14. Sacro-lumbalis (i).	From the back part of the os ſacrum, ſpine of the ilium, ſpinous proceſſes and roots of the tranſverſe proceſſes of the vertebræ of the loins.	Into the lower edge of each rib.	To draw the ribs downwards, move the body upon its axis, aſſiſt in erecting the trunk, and turn the neck backwards, or to one ſide.
15. Longiſſimus dorſi (k).	The ſame as that of the ſacro-lumbalis.	Into the tranſverſe proceſſes of the dorſal vertebræ.	To ſtretch the vertebræ of the back, and keep the trunk erect.
16. Spinalis dorſi.	From the ſpinous proceſſes of the uppermoſt lumbar and lowermoſt dorſal vertebræ.	Into the ſpinous proceſſes of the nine ſuperior dorſal vertebræ.	To extend the vertebræ.
17. Semi-ſpinalis dorſi.	From the tranſverſe proceſſes of the 7th, 8th, 9th, and 10th vertebræ of the back.	Into the ſpinous proceſſes of the four uppermoſt dorſal, and lowermoſt of the cervical vertebræ.	To extend the ſpine obliquely backwards.
18. Multifidus Spinæ (l).	From the os ſacrum, ilium, oblique and tranſverſe proceſſes of the lumbar vertebræ, tranſverſe proceſſes of the dorſal, and four of the cervical vertebræ.	Into the ſpinous proceſſes of the lumbar, dorſal, and ſix of the cervical vertebræ.	To extend the back and draw it backwards, or to one ſide.
19. Semi-ſpinalis colli.	From the tranſverſe proceſſes of the five or ſix uppermoſt dorſal vertebræ.	Into the ſpinous proceſſes of the 2d, 3d, 4th, 5th, and 6th cervical vertebræ.	To ſtretch the neck obliquely backwards.
20. Scalenus (m).	From the tranſverſe proceſſes of the five inferior cervical vertebræ.	Into the upper and outer part of the firſt and ſecond ribs.	To move the neck forwards, or to one ſide.

21. Inter-

(i) Several thin faſciculi of fleſhy fibres ariſe from the lower ribs, and terminate in the inner ſide of this muſcle. Steno names them *maſculi ad ſacro lumbalem acceſſorii.* The ſacro-lumbalis likewiſe ſends off a fleſhy ſlip from its upper part, which by Douglas and Albinus is deſcribed as a diſtinct muſcle, under the name of *cervicalis deſcendens.* Morgagni has very properly conſidered it as a part of the ſacro-lumbalis.

(k) At the upper part of this muſcle a broad thin layer of fleſhy fibres is found croſſing, and intimately adhering to it. This portion, which is deſcribed by Albinus, under the name of *tranſverſalis cervicis,* may very properly be conſidered as an appendage to the longiſſimus dorſi. It ariſes from the tranſverſe proceſſes of the five or ſix ſuperior dorſal vertebræ, and is inſerted into the tranſverſe proceſſes of the ſix inferior cervical vertebræ. By means of this appendage the longiſſimus dorſi may ſerve to move the neck to one ſide, or obliquely backwards.

(l) Anatomiſts in general have unneceſſarily multiplied the muſcles of the ſpine. Albinus has the merit of having introduced greater ſimplicity into this part of myology. Under the name of *multifidus ſpinæ,* he has very properly included thoſe portions of muſcular fleſh intermixed with tendinous fibres, ſituated cloſe to the back part of the ſpine, and which are deſcribed by Douglas under the names of *tranſverſales colli, dorſi, & lumborum.*

(m) The ancients gave it this name from its reſemblance to an irregular triangle (σκαληνος). It conſiſts of three fleſhy portions. The anterior one affords a paſſage to the axillary artery, and between this and the middle portion we find the nerves going to the upper extremities. The middle is in part covered by the poſterior portion, which is the longeſt and thinneſt of the three.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	21. Inter-ſpinalis (N).	From the upper part of each of the ſpinous proceſſes of the ſix inferior cervical vertebræ.	Into the under part of each of the ſpinous proceſſes of the vertebræ above.	To draw the ſpinous proceſſes towards each other.
	22. Inter-tranſverſales (O).	From the upper part of each of the tranſverſe proceſſes of the vertebræ.	Into the under part of each of the tranſverſe proceſſes of the vertebræ above.	To draw the tranſverſe proceſſes towards each other.
MUSCLES within the cavity of the abdomen, on the anterior and lateral parts of the ſpine,	1. Pſoas parvus (P).	From the ſides and tranſverſe proceſſes of the uppermoſt lumbar vertebra, and ſometimes of the lowermoſt dorſal vertebra.	Into the brim of the pelvis, at the junction of the os pubis with the ilium.	To bend the loins forwards.
	2. Pſoas magnus.	From the bodies and tranſverſe proceſſes of the laſt dorſal, and all the lumbar vertebræ.	Into the os femoris, a little below the trochanter minor.	To bend the thigh forwards.
	3. Iliacus internus.	From the inner lip, hollow part, and edge of the os ilium.	In common with the pſoas magnus.	To aſſiſt the pſoas magnus.
	4. Quadratus lumborum (Q).	From the poſterior part of the ſpine of the ilium.	Into the tranſverſe proceſſes of the four uppermoſt lumbar vertebræ, the inferior edge of the laſt rib, and the ſide of the lowermoſt dorſal vertebra.	To ſupport the ſpine, or to draw it to one ſide.
	5. Coccygæus.	From the poſterior and inner edge of the ſpine of the iſchium.	Into the lower part of the os ſacrum, and almoſt the whole length of the os coccygis latterally.	To draw the os coccygis forwards and inwards (R)
—— on the ſcapula and upper part of the os humeri,	1. Deltoides (S).	From the clavicle, proceſſus acromion, and ſpine of the ſcapula.	Into the anterior and middle part of the os humeri.	To raiſe the arm.
	2. Supra-ſpinatus.	From the baſis, ſpine, and upper coſta of the ſcapula.	Into a large tuberoſity at the head of the os humeri.	To raiſe the arm.

(N) In the generality of anatomical books we find theſe muſcles divided into *inter-ſpinalis cervicis, dorſi,* and *lumborum,* but we do not find any ſuch muſcles either in the loins or back.

(O) Theſe muſcles are to be found only in the neck and loins; which have been deſcribed, as the *inter-tranſverſales dorſi* being rather ſmall tendons than muſcles.

(P) This and the following pair of muſcles derive their name of *pſoas* from ψοα, *lumbus,* on account of their ſituation at the anterior part of the loins.

(Q) So called from its ſhape, which is that of an irregular ſquare.

(R) Some of the fibres of this muſcle are united with thoſe of the levator ani, ſo that it aſſiſts in cloſing the lower part of the pelvis.

(S) So named from its ſuppoſed reſemblance to the Greek Δ reverſed.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	3. Infra-ſpinatus.	From the baſe and ſpine of the ſcapula.	Into the upper and middle part of the tuberoſity.	To roll the os humeri outwards.
	4. Teres minor (T)	From the inferior coſta of the ſcapula.	Into the lower part of the tuberoſity.	To aſſiſt the infra ſpinatus.
	5. Teres major.	From the inferior angle, and inferior coſta of the ſcapula.	Into the ridge at the inner ſide of the groove formed for the long head of the biceps.	To aſſiſt in the rotatory motion of the arm.
	6. Subſcapularis.	From the baſis, ſuperior and inferior coſta of the ſcapula.	Into the upper part of a ſmall tuberoſity at the head of the os humeri.	To roll the arm inwards.
	7. Coraco-brachialis (U)	From the coracoid proceſs of the ſcapula.	Into the middle and inner ſide of the os humeri.	To roll the arm forwards and upwards.
Muscles on the os humeri, - -	1. Biceps flexor cubiti.	By two heads, one from the coracoid proceſs, and the other, or long head, from the upper and outer edge of the glenoid cavity of the ſcapula.	Into the tuberoſity at the upper end of the radius.	To bend the fore-arm.
	2. Brachialis internus.	From the os humeri, below, and at each ſide of the tendon of the deltoides.	Into a ſmall tuberoſity at the fore part of the coronoid proceſs of the ulna.	To aſſiſt in bending the fore-arm.
	3. Triceps extenſor cubiti.	By three heads: the firſt, from the inferior coſta of the ſcapula; the ſecond, from the upper and outer part of the os humeri; and the third, from the back part of that bone.	Into the upper and outer part of the olecranon.	To extend the fore-arm.
——— on the fore-arm, - -	1. Supinator longus.	From the outer ridge and anterior ſurface of the os humeri, a little above its outer condyle.	Into the radius near its ſtyloid proceſs.	To aſſiſt in turning the palm of the hand upwards.
	2. Extenſor carpi radialis longus.	Immediately below the origin of the nator longus.	Into the upper part of the metacarpal bone of the fore-finger.	To extend the wriſt.
	3. Extenſor carpi radialis brevis.	From the outer and lower part of the outer condyle of the os humeri, and the upper part of the radius.	Into the upper part of the metacarpal bone of the middle finger.	To aſſiſt the extenſor longus.
	4. Extenſor digitorum communis.	From the outer condyle of the os humeri.	Into the back part of all the bones of the fore finger.	To extend the fingers.

5. Extenſor

(T) This and the following pair are called *teres*, from their being of a long and round ſhape.

(U) This muſcle affords a paſſage to the muſculo-cutaneous nerve.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
5. Extenſor minimi digiti.	From the outer condyle of the os humeri.	Into the bones of the little finger.	To extend the little finger.
6. Extenſor carpi ulnaris.	From the outer condyle of the os humeri.	Into the metacarpal bone of the little finger.	To aſſiſt in extending the wriſt.
7. Anconæus (v).	From the outer condyle of the os humeri.	Into the outer edge of the ulna.	To extend the fore arm.
8. Flexor carpi ulnaris.	From the inner condyle of the os humeri, and anterior edge of the olecranon (w).	Into the os piſiforme.	To aſſiſt in bending the hand.
9. Palmaris longus.	From the inner condyle of the os humeri.	Into the internal annular ligament, and aponeuroſis palmaris (x).	To bend the hand.
10. Flexor carpi radialis.	From the inner condyle of the os humeri.	Into the metacarpal bone of the fore finger.	To bend the hand.
11. Pronator radii teres.	From the outer condyle of the os humeri, and coronoid proceſs of the ulna.	Into the anterior and convex edge of the radius near its middle.	To roll the hand inwards.
12. Flexor ſublimis perforatus (y).	From the inner condyle of the os humeri, inner edge of the coronoid proceſs of the ulna, and upper and anterior part of the radius.	Into the ſecond bone of each finger.	To bend the ſecond joint of the finger.
13. Supinator radii brevis.	From the outer condyle of the os humeri, and poſterior ſurface and outer edge of the ulna.	Into the anterior, inner, and upper part of the radius.	To roll the radius outwards.
14. Abductor pollicis longus.	From the middle and back part of the ulna, interoſſeous ligament, and radius.	By two tendons into the os trapezium, and firſt bone of the thumb.	To ſtretch the firſt bone of the thumb outwards.
15. Extenſor minor pollicis.	From the back part of the ulna, and interoſſeous ligament and radius.	Into the convex part of the ſecond bone of the thumb.	To extend the ſecond bone of the thumb obliquely outwards.
16. Extenſor major pollicis.	From the back of the ulna and interoſſeous ligament.	Into the third and laſt bone of the thumb.	To ſtretch the thumb obliquely backwards.
17. Indicator.	From the middle of the ulna.	Into the metacarpal bone of the fore-finger.	To extend the fore-finger.

(v) So called from *αγκων*, *cubitus*.

(w) Between the two origins of this muſcle we find the ulnor-nerve going to the fore arm.

(x) The aponeuroſis palmaris is a tendinous membrane that extends over the palm of the hand. Some anatomiſts have ſuppoſed it to be a production of the tendon of this muſcle, but without ſufficient grounds; for in ſome ſubjects we find the palmaris longus inſerted wholly into the annular ligament, ſo as to be perfectly diſtinct from this aponeuroſis; and it now and then happens, that no palmaris longus is to be found, whereas this expanſion is never deficient.

(y) This muſcle is named *perforatus*, on account of the four tendons in which it terminates, being perforated by thoſe of another muſcle, the perforans.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	18. Flexor profundus perforans.	From the upper and fore part of the ulna, and interoſſeous ligament.	Into the fore part of the laſt bone of each of the fingers.	To bend the laſt joint of the fingers.
	19. Flexor longus pollicis.	From the upper and fore part of the radius.	Into the laſt joint of the thumb.	To bend the laſt joint of the thumb.
	20. Pronator radii quadratus.	From the inner and lower part of the ulna.	Into the radius, oppoſite to its origin.	To roll the radius inwards, and of courſe to aſſiſt in the pronation of the hand.
MUSCLES on the hand,	1. Lumbricales (z).	From the tendons of the perforans.	Into the tendons of the extenſor digitorum communis.	To bend the firſt, and to extend the two laſt joints of the fingers (A).
	2. Abductor brevis pollicis.	From the fore part of the internal annular ligament, os ſcaphoides, and one of the tendons of the abductor longus pollicis.	Into the outer ſide of the 2d bone of the thumb, near its root.	To move the thumb from the fingers.
	3. Opponens pollicis.	From the inner and anterior part of the internal annular ligament, and from the os ſcaphoides.	Into the firſt bone of the thumb.	To move the thumb inwards, and to turn it upon its axis.
	4. Flexor brevis pollicis.	From the os trapezoides, internal annular ligament, os magnum, and os unciforme.	Into the oſſa ſeſamoidea and ſecond bone of the thumb.	To bend the ſecond joint of the thumb.
	5. Abductor pollicis.	From the metacarpal bone of the middle finger.	Into the baſis of the ſecond bone of the thumb.	To move the thumb towards the fingers.
	6. Abductor indices.	From the inner ſide of the firſt bone of the thumb, and from the os trapezium.	Into the firſt bone of the fore finger poſteriorly.	To move the fore finger towards the thumb.
	7. Palmaris brevis.	From the internal annular ligament, and aponeuroſis palmaris.	Into the os piſiforme, and the ſkin covering the abductor minimi digiti.	To contract the palm of the hand.
	8. Abductor minimi digiti.	From the internal annular ligament and os piſiforme.	Into the ſide of the firſt bone of the little finger.	To draw the little finger from the reſt.
	9. Flexor parvus minimi digiti.	From the os unciforme and internal annular ligament.	Into the firſt bone of the little finger.	To bend the little finger.
	10. Abductor metacarpi minimi digiti.	From the os unciforme and internal annular ligament.	Into the metacarpal bone of the little finger.	To move that bone towards the reſt.
	11. Interoſſei interni.	Situated between the metacarpal bones.	Into the roots of the fingers.	To extend the fingers and move them towards the thumb (B).

12. Interoſſei

(z) So named from their being ſhaped ſomewhat like the lumbricus or earth-worm.

(A) Fallopius was the firſt who remarked the two oppoſite uſes of this muſcle. Their extending power is owing to their connection with the extenſor communis.

(B) The third interoſſeus internus (for there are four of the externi and three of the interni) differs from the reſt in drawing the middle finger from the thumb.

Of the Muſcles.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	12. Interoſſei externi.	Situated between the metacarpal bones on the back of the hand.	Into the roots of the fingers.	To extend the fingers; but the firſt draws the middle finger inwards, the ſecond draws it outwards, and the third draws the ring finger inwards.
MUSCLES at the back part of the pelvis, and upper part of the thigh, - -	1. Glutæus (C) maximus.	From the ſpine of the ilium, poſterior ſacro iſchiatic ligaments, os ſacrum, and os coccygis.	Into the upper part of the *linea aſpera* of the os femoris.	To extend the thigh and draw it outwards.
	2. Glutæus medius.	From the ſpine and ſuperior ſurface of the ilium.	Into the outer and back part of the great trochanter of the os femoris.	To draw the thigh outwards and a little backwards, and when it is bended, to roll it.
	3. Glutæus minimus.	From the outer ſurface of the ilium and the border of its great niche.	Into the upper and anterior part of the great trochanter.	To aſſiſt the former.
	4. Pyriformis (D).	From the anterior part of the os ſacrum.	Into a cavity at the root of the trochanter major.	To roll the thigh outwards.
	5. Gemini (E).	By two portions, one from the outer ſurface of the ſpine of the iſchium; the other from the tuberoſity of the iſchium and poſterior ſacro-iſchiatic ligament.	Into the ſame cavity as the pyriformis.	To roll the thigh outwards, and likewiſe to confine the tendon of the obturator internus, when the latter is in action.
	6. Obturator internus.	From the ſuperior half of the inner border of the foramen thyroideum.	Into the ſame cavity with the former.	To roll the thigh outwards.
	7. Quadratus (F) femoris.	From the tuberoſity of the iſchium.	Into a ridge between the trochanter major and trochanter minor.	To move the thigh outwards.
——— on the thigh (G), - - -	1. Biceps flexor cruris.	By two heads; one from the tuberoſity of the iſchium,	Into the upper and back part of the fibula (H).	To bend the leg.

(C) From γλȣτος, *nates*.

(D) So named from its pear-like ſhape.

(E) The two portions of this muſcle having been deſcribed as two diſtinct muſcles by ſome anatomiſts, have occaſioned it to be named *gemini*. The tendon of the obturator internus runs between theſe two portions.

(F) This muſcle is not of the ſquare ſhape its name would ſeem to indicate.

(G) The muſcles of the leg and thigh are covered by a broad tendinous membrane called *faſcia lata*, that ſurrounds them in the manner of a ſheath. It is ſent off from the tendons of the glutæi and other muſcles, and dipping down between the muſcles it covers, adheres to the linea aſpera, and ſpreading over the joint of the knee, gradually diſappears on the leg. It is thickeſt on the inſide of the thigh.

(H) The tendon of this muſcle forms the *outer ham-ſtring*.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
	the other from the linea aſpera near the inſertion of the glutæus maximus.		
2. Semitendinoſus.	From the tuberoſity of the iſchium.	Into the upper and inner part of the tibia.	To bend and draw the leg inwards.
3. Semi-membranoſus (I).	From the tuberoſity of the iſchium.	Into the upper and back part of the head of the tibia.	To bend the leg.
4. Tenſor vaginæ femoris.	From the ſuperior and anterior ſpinous proceſs of the ilium.	Into the inner ſide of the faſcia lata, which covers the outſide of the thigh.	To ſtretch the faſcia.
5. Sartorius.	From the ſuperior and anterior ſpinous proceſs of the ilium.	Into the upper and inner part of the tibia.	To bend the leg inwards (K).
6. Rectus.	By two tendons; one from the anterior and inferior ſpinous proceſs of the ilium; the other from the poſterior edge of the cotyloid cavity.	Into the upper and fore-part of the patella.	To extend the leg.
7. Gracilis.	From the fore-part of the iſchium and pubis.	Into the upper and inner part of the tibia.	To bend the leg.
8. Vaſtus externus (L).	From the anterior and lower part of the great trochanter, and the outer edge of the linea aſpera.	To the upper and outer part of the patella.	To extend the leg.
9. Vaſtus internus.	From the inner edge of the linea aſpera, beginning between the fore-part of the os femoris and the root of the leſſer trochanter.	Into the upper and inner part of the patella.	To extend the leg.
10. Cruræus (M).	From the outer and anterior part of the leſſer trochanter.	Into the upper part of the patella.	To extend the leg.
11. Pectinalis.	From the anterior edge of the os pubis, or pectinis, as it is ſometimes called.	Into the upper and fore part of the linea aſpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.

(I) So named on account of its origin, which is by a broad flat tendon three inches long.

(K) Spigelius was the firſt who gave this the name of *ſartorius*, or the taylor's muſcle, from its uſe in croſſing the legs.

(L) The vaſtus externus, vaſtus internus, and cruræus, are ſo intimately connected with each other, that ſome anatomiſts have been induced to conſider them as a *triceps*, or ſingle muſcle with three heads.

(M) Under the cruræus we ſometimes meet with two ſmall muſcles, to which Albinus has given the name of *ſub-cruræi*. They terminate on each ſide of the patella, and prevent the capſular ligament from being pinched. When they are wanting, which is very often the caſe, ſome of the fibres of the cruræus are found adhering to the capſula.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	12. Abductor longus femoris (N).	From the upper and fore part of the os pubis.	Near the middle and back part of the linea aſpera.	To draw the thigh inwards, upwards, and to roll it a little outwards.
	13. Abductor brevis femoris.	From the fore part of the ramus of the os pubis.	Into the inner and upper part of the linea aſpera.	
	14. Abductor magnus femoris.	From the lower and fore part of the ramus of the os pubis.	Into the whole length of the linea aſpera.	
	15. Obturator externus.	From part of the obturator ligament; and the inner half of the circumference of the foramen thyroideum.	Into the os femoris near the root of the great trochanter.	To move the thigh outwards in an oblique direction, and likewiſe to bend and draw it inwards.
MUSCLES on the leg,	1. Gaſtrocnemius (O) externus.	By two heads; one from the inner condyle, the other from the outer condyle of the os femoris.	By a great round tendon, common to this and the following muſcle.	To extend the foot.
	2. Gaſtrocnemius (P) internus.	By two heads; one from the back part of the head of the fibula, the other from the upper and back part of the tibia.	By a large tendon (the *tendo achillis)* common to this and the former muſcle, into the lower and back part of the os calcis.	To extend the foot.
	3. Plantaris (Q)	From the upper and poſterior part of the outer condyle of the os femoris.	Into the inſide of the back part of the os calcis.	To aſſiſt in extending the foot.
	4. Popliteus (R)	From the outer condyle of the thigh.	Into the upper and inner part of the tibia.	To aſſiſt in bending the leg and rolling it inwards.
	5. Flexor longus digitorum pedis (S)	From the upper and inner part of the tibia.	By four tendons, which, after paſſing through the perforations in thoſe of the flexor digitorum brevis, are inſerted into the laſt bone of all the toes except the great toe.	To bend the laſt joint of the toe.
	6. Flexor longus pollicis pedis.	From the back part, and a little below the head of the fibula.	Into the laſt bone of the great toe.	To bend the great toe.

(N) This and the two following muſcles have been uſually, but improperly, conſidered as forming a ſingle muſcle with three heads, and on that account named *triceps femoris.*

(O) Ταςροκνημια, *ſura,* "the calf of the leg."

(P) This muſcle is by ſome anatomiſts named *ſoleus,* on account of its being ſhaped like the ſole-fiſh.

(Q) This muſcle has gotten the name of *plantaris,* from its being ſuppoſed to furniſh the aponeuroſis that covers the ſole of the foot; but it does not in the leaſt contribute to the formation of that tendinous expanſion.

(R) So called on account of its ſituation at the ham *(poples).*

(S) This muſcle, about the middle of the foot, unites with a fleſhy maſs, which, from its having firſt been deſcribed by Sylvius, is uſually called *maſſa carnea* JACOBI SYLVII.

	Name.	*Origin.*	*Inſertion.*	*Uſe.*
	7. Tibialis poſticus.	From the back part and outer edge of the tibia, and likewiſe from the interoſſeous ligament and adjacent part of the fibula.	Into the inner and upper part of the os naviculare and ſide of the os cuneiforme medium.	To move the foot inwards.
	8. Peroneus longus.	From the outer ſide of the head of the tibia, and alſo from the upper, anterior, and outer part of the *perone* or fibula, to which it adheres for a conſiderable way down.	Into the metatarſal bone of the great toe.	To move the foot outwards.
	9. Peroneus brevis.	From the outer and fore-part of the fibula.	Into the metatarſal bone of the little toe.	To aſſiſt the laſt deſcribed muſcle.
	10. Extenſor longus digitorum pedis.	From the upper, outer, and fore part of the tibia, interoſſeous ligament, and inner edge of the fibula.	By four tendons into the firſt joint of the ſmaller toes.	To extend the toes.
	11. Peroneus tertius.	From the fore-part of the lower half of the fibula, and from the interoſſeous ligament.	Into the metatarſal bone of the little toe.	To bend the foot.
	12. Tibialis anticus.	From the upper and fore part of the tibia.	Into the os cunieforme internum.	To bend the foot.
	13. Extenſor proprius pollicis pedis.	From the upper and fore part of the tibia.	Into the convex ſurface of the bones of the great toe.	To extend the great toe.
Muscles on the foot,	1. Extenſor brevis digitorum pedis.	From the upper and anterior part of the os calcis.	By four tendons; one of which joins the tendon of the externus longus pollicis, and the other three the tendons of the extenſor digitorum longus.	To extend the toes.
	2. Flexor brevis digitorum pedis.	From the lower part of the os calcis.	By four tendons, which, after affording a paſſage to thoſe of the flexor longus, are inſerted into the ſecond phalanx of each of the ſmall toes.	To bend the ſecond joint of the toes.
	3. Abductor pollicis pedis.	From the inner and lower part of the os calcis.	Into the firſt joint of the great toe.	To move the great toe from the other toes.
	4. Abductor minimi digiti.	From the outer tubercle of the os calcis, the root of the metatarſal bone of the little toe, and alſo from the aponeuroſis plantaris.	Into the outer ſide of the firſt joint of the little toe.	To draw the little toe outwards.

Name.	*Origin.*	*Inſertion.*	*Uſe.*
5. Lumbricales pedis.	From the tendons of the flexor longus digitorum pedis.	Into the tendinous expanſion at the upper part of the toes.	To draw the toes inwards.
6. Flexor brevis pollicis pedis.	From the inferior and anterior part of the os calcis, and alſo from the inferior part of the os cuneiforme externum.	By two tendons into the firſt joint of the great toe.	To bend the firſt joint of the great toe.
7. Adductor pollicis pedis.	From near the roots of the metatarſal bones of the 2d, 3d, and 4th toes.	Into the outer os ſeſamoideum, or firſt joint of the great toe.	To draw the great toe nearer to the reſt, and alſo to bend it.
8. Tranſverſales pedis.	From the outer and under part of the anterior end of the metatarſal bone of the little toe.	Into the inner os ſeſamoideum, and anterior end of the metatarſal bone of the great toe.	To contract the foot.
9. Flexor brevis minimi digiti pedis.	From the baſis of the metatarſal bone of the little toe.	Into the firſt joint of the little toe.	To bend the little toe.
10. Interoſſei pedis interni (T).	Situated between the metatarſal bones.		
——— externi (U).			

EXPLANATION OF PLATES XXIII. AND XXIV.

PLATE XXIII.

FIG. 1. The MUSCLES immediately under the common teguments on the anterior part of the body are repreſented on the right ſide ; and on the left ſide the MUSCLES are ſeen which come in view when the exterior ones are taken away.

A, The frontal muſcle. B, The tendinous aponeuroſis which joins it to the occipital ; hence both named *occipito-frontalis.* C, Attolens aurem. D, The ear. E, Anterior auris. F F, Orbicularis palpebrarum. G, Levator labii ſuperioris alæque naſi. H, Levator anguli oris. I, Zygomaticus minor. K, Zygomaticus major. L, Maſſeter. M, Orbicularis oris. N, Depreſſor labii inferioris. O, Depreſſor anguli oris. P, Buccinator. Q Q, Platyſma myoides. RR, Sterno-cleido-maſtoidæus. S, Part of the trapezius. T, Part of the ſcaleni.

SUPERIOR EXTREMITY.—U, Deltoides. V, Pectoralis major. W, Part of the latiſſimus dorſi. XX, Biceps flexor cubiti. Y Y, Part of the brachialis externus. Z Z, The beginning of the tendinous aponeuroſis (from the biceps), which is ſpread over the muſcles of the fore-arm. a a, Its ſtrong tendon inſerted into the tubercle of the radius. b b, Part of the brachialis internus. c, Pronator radii teres. d, Flexor carpi radialis. e, Part of the flexor carpi ulnaris. f, Palmaris longus. g, Aponeuroſis palmaris. 3. Palmaris brevis. 1, Ligamentum carpi annulare. 2 2, Abductor minimi digiti. h, Supinator radii longus. i, The tendons of the thumb. k, Abductor pollicis. l, Flexor pollicis longus. m m, The tendons of the flexor ſublimis perforatus, profundus perforans, and lumbricales.—The ſheaths are entire in the right hand,—in the left cut open to ſhow the tendons of the flexor profundus perforating the ſublimis.

MUSCLES not referred to—in the left ſuperior extremity.—n, Pectoralis minor, ſeu ſerratus anticus minor. o, The two heads of (x x) the biceps. p, Coracobrachialis. q q, The long head of the triceps extenſor cubiti. r r, Teres major. ſ ſ, Subſcapularis. t t, Extenſores radiales. u, Supinator brevis. v, The cut extremity of the pronator teres. w, Flexor ſublimis perforatus. x, Part of the flexor profundus. y, Flexor pollicis longus. z, Part of the flexor pollicis brevis. 4, Abductor minimi digiti. 5, The four lumbricales.

TRUNK.—6, Serrated extremities of the ſerratus anticus major. 7 7, Obliquus externus abdominis. 8 8, The linea alba. 9, The umbilicus. 10, Pyramidalis. 11 11, The ſpermatic cord. On the left ſide it is covered by the cremaſter. 12 12, Rectus abdominis. 13, Obliquus internus. 14 14, &c. Intercoſtal muſcles.

INFERIOR EXTREMITIES.—*a a,* The gracilis. *b b,* Parts of the triceps. *c c,* Pectialis. *d d,* Pſoas magnus. *e e,* Iliacus internus. *f,* Part of the glutæus medius. *g,* Part of the glutæus minimus. *h,* Cut extremity of the rectus cruris. *i i,* Vaſtus externus, *k,* Tendon of the rectus cruris. *l l,* Vaſtus internus.

(T) The interoſſei interni are three in number ; their uſe is to draw the ſmaller toes towards the great toe.

(U) The interoſſei externi are four in number ; the firſt ſerves to move the fore-toe towards the great toe : the reſt move the toes outwards. All the interoſſei aſſiſt in extending the toes.

Of the Muſcles.

* Sartorius muſcle. * * Fleſhy origin of the tenſor vaginæ fæmoris or membranoſus. Its tendinous aponeuroſis covers (*i*) the vaſtus externus in the right ſide. *m m*, Patella. *n n*, Ligament or tendon from it to the tibia. *o*, Rectus cruris. *p*, Cruræus. *q q*, The tibia. *r r*, Part of the Gemellus or gaſtrocnemius externus.* *ſſſ*, Part of the ſoleus or gaſtrocnemius internus. *t*, Tibialis anticus. *u*, Tibialis poſticus. *v v*, Peronæi muſcles. *w w*, Extenſor longus digitorum pedis. *x x*, Extenſor longus pollicis pedis. *y*, Abductor pollicis pedis.

FIG. 2. The MUSCLES, GLANDS, &c. of the Left Side of the face and neck, after the common Teguments and Platyſma myoides have been taken off.

a, The frontal muſcle. b, Temporalis and temporal artery. c, Orbicularis palpebrarum. d, Levator labii ſuperioris alæqui naſi. e, Levator anguli oris. f, Zygomaticus. g, depreſſor labii inferioris. h, Depreſſor anguli oris. i, Buccinator. k, Maſſeter. l l, Parotid gland. m, Its duct. n, Sterno-cleido-maſtoidæus. o, Part of the trapezius. p, Sterno-hyoidæus. q, Sterno-thyroidæus. r, Omo-hyoidæus. ſ, Levator ſcapulæ. t t, Scaleni. u, Part of the ſplenius.

FIG. 3. The MUSCLES of the Face and Neck in view after the exterior ones are taken away.

a a, Corrugator ſupercilii. b, Temporalis. c, Tendon of the levator palpebræ ſuperioris. d, Tendon of the orbicularis palpebrarum. e, Maſſeter. f, Buccinator. g, Levator anguli oris. h, Depreſſor labii ſuperioris alæque naſi. i, Orbicularis oris. k, Depreſſor anguli oris. l, Muſcles of the os hyoides. m, Sterno-cleido-maſtoidæus.

FIG. 4. Some of the MUSCLES of the Os Hyoides and Submaxillary Gland.

a, Part of the maſſeter muſcle. b, Poſterior head of the digraſtic. c, Its anterior head. d d, Sterno-hyoidæus. e, Omo-hyoidæus. f, Stylo-hyoidæus. g, Submaxillary gland in ſitu.

FIG. 5. The Submaxillary Gland and Duct.

a, Muſculus mylo-hyoidæus. b, Hyo-gloſſus. c, Submaxillary gland extra ſitu. d, Its duct.

PLATE XXIV.

FIG. 1. The MUSCLES immediately under the common teguments on the poſterior part of the body, are repreſented in the right ſide; and on the left ſide the MUSCLES are ſeen which come in view when the exterior ones are taken away.

HEAD.—A A, Occipito-frontalis. B, Attollens aurem. C, Part of the orbicularis palpebrarum. D, Maſſeter. E, Pterygoidæus internus.

TRUNK.—Right ſide. F F F, Trapezius ſeu cucullaris. G G G G, Latiſſimus dorſi. H, Part of the obliquus externus abdominis.

TRUNK.—Left ſide. I, Splenius. K, Part of the complexus. L, Levator ſcapulæ. M, Rhomboides. N N, Serratus poſticus inferior. O, Part of the longiſſimus dorſi. P, Part of the ſacro-lumbalis. Q, Part of the ſemi-ſpinalis dorſi. R, Part of the ſerratus anticus major. S, Part of the obliquus internus abdominis.

Of the Muſcles.

SUPERIOR EXTREMITY.—Right ſide. T, Deltoides U, Triceps extenſor cubiti. V, Supinator longus. W W, Extenſores carpi radialis longior and brevior. X X, Extenſor carpi ulnaris. Y Y, Extenſor digitorum communis. Z, Abductor indicis. 1 2 3, Extenſores pollicis.

SUPERIOR EXTREMITY.—Left ſide. a, Supra ſpinatus. b, Infra-ſpinatus. c, Teres minor. d, Teres major. e, Triceps extenſor cubiti. f f, Extenſores carpi radiales. g, Supinator brevis. h, Indicator. 1 2 3, Extenſores pollicis. i, Abductor minimi digiti. k, Interoſſei.

INFERIOR EXTREMITY.—Right ſide. l, Glutæus maximus. m, Part of the Glutæus medius. n, Tenſor vaginæ femoris. o, Gracilis. p p, Abductor femoris magnus. q, Part of the vaſtus internus. r, Semimembranoſus. s, Semitendinoſus. t, Long head of the biceps flexor cruris. u u, Gaſtrocnemius externus ſeu gemellus. v, Tendo Achillis. w, Soleus ſeu gaſtrocnemius internus. x x, Peronæus longus and brevis. y, Tendons of the flexor longus digitorum pedis;—and under them * flexor brevis digitorum pedis. z, Abductor minimi digiti pedis.

INFERIOR EXTREMITY.—Left ſide. *m*, *n*, *o*, *p*, *q*, *r*, *s*, *t*, *v*, *w w*, *x x*, *y*, *z*, Point the ſame parts as in the right ſide. *a*, Pyriformis. *b b*, Gemini. *c c*, Obturator internus. *d*, Quadratus femoris. *e*, Coccygæus. *f*, The ſhort head of the biceps flexor cruris. *g g*, Plantaris. *h*, Poplitæus. *i*, Flexor longus pollicis pedis.

FIG. 2. The Palm of the Left Hand after the common Teguments are removed, to ſhow the MUSCLES of the Fingers.

a, Tendon of the flexor carpi radialis. b, Tendon of the flexor carpi ulnaris. c, Tendons of the flexor ſublimis perforatus, profundus perforans and lumbricales. d, Abductor pollicis. e e, Flexor pollicis longus. f, Flexor pollicis brevis. g, Palmaris brevis. h, Abductor minimi digiti. i, Ligamentum carpiannulare. k, A probe put under the tendons of the flexor digitorum ſublimis; which are perforated by l, the flexor digitorum profundus. m m m m, Lumbricales. n, Abductor pollicis.

FIG. 3 A Fore-view of the foot and Tendons of the Flexores Digitorum.

a, Cut extremity of the tendo Achillis. b, Upper part of the aſtragalus. c, Os calcis. d, Tendon of the tibialis anticus. e, Tendon of the extenſor pollicis longus. f, Tendon of the peronæus brevis. g, Tendons of the flexor digitorum longus, with the nonus Veſalii. h h, The whole of the flexor digitorum brevis.

FIG. 4. MUSCLES of the Anus.

a a, An out line of the buttocks, and upper part of the thighs. b, The teſtes contained in the ſcrotum. c c, Sphincter ani. d, Anus. e, Levator ani. f f, Erector penis. g g, Accelerator urinæ. h, Corpus cavernoſum urethræ.

FIG. 5. MUSCLES of the Penis.

a a, b, d, e e, f f, h, point the ſame as in fig. 4. c, Sphincter ani. g g, Tranſverſalis penis.

Fig. 2.

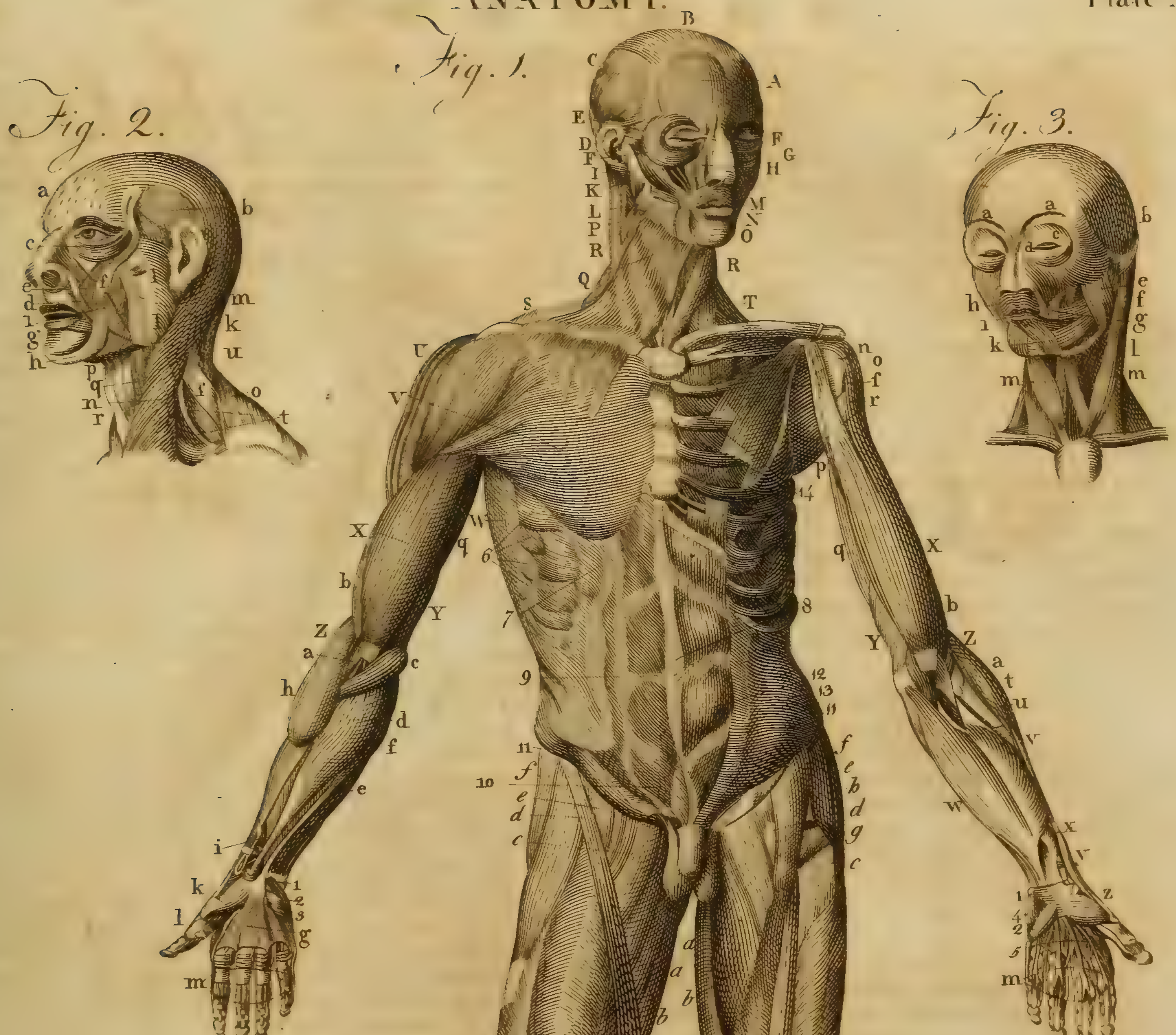


Fig. 1.

Fig. 3.

Fig. 4.

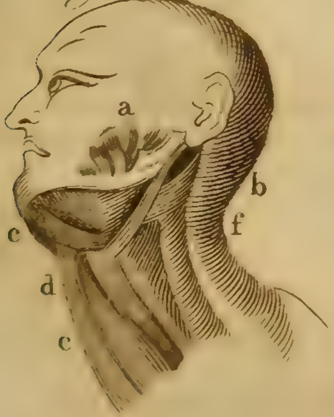
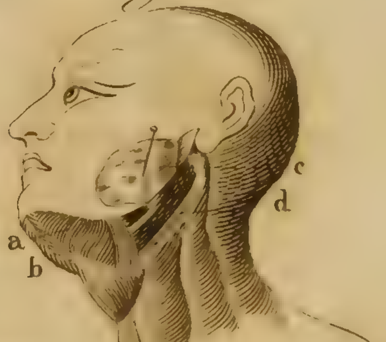


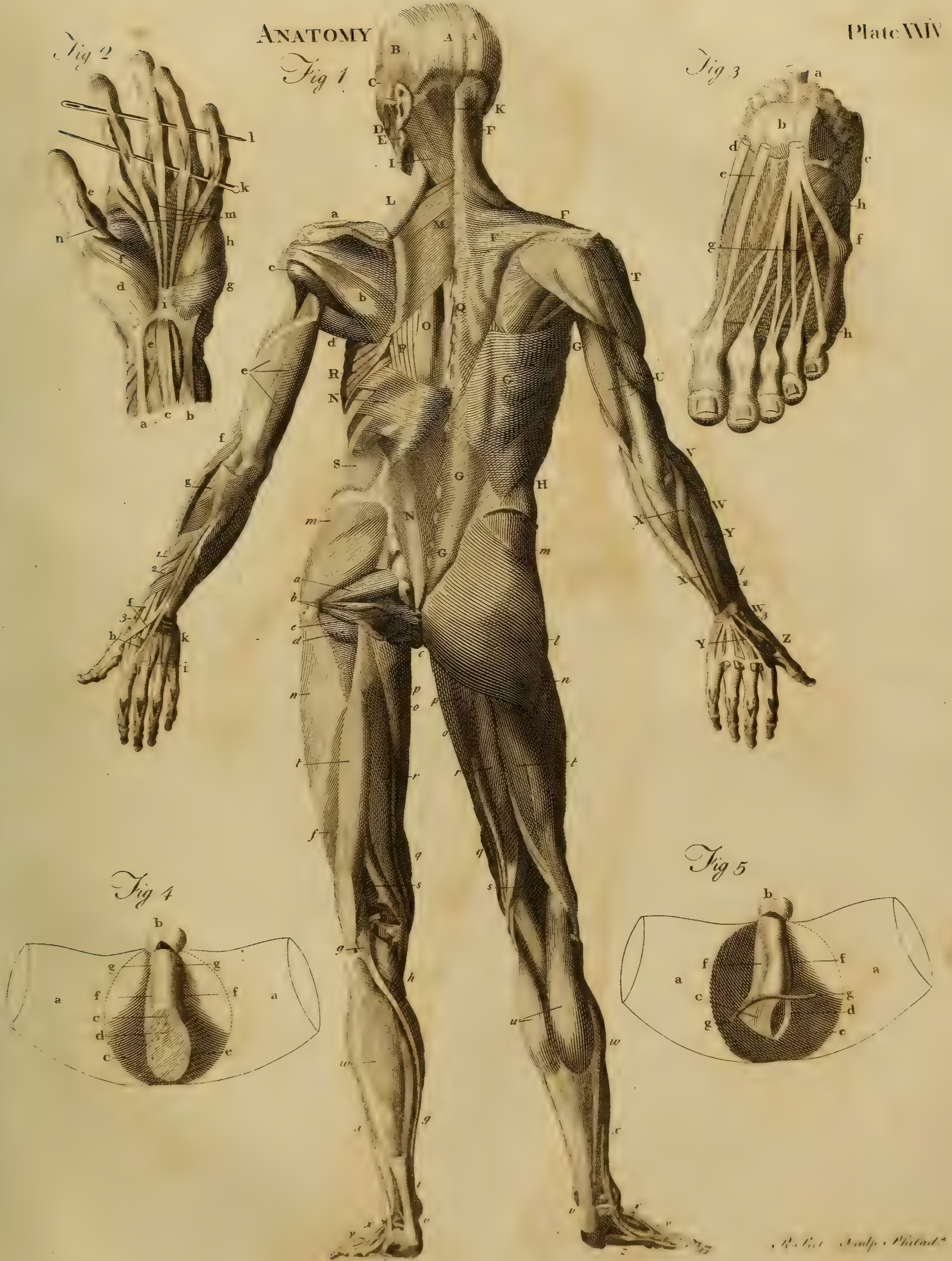
Fig. 5.



Jn. [illegible] Sculpt. Edinr

ANATOMY

Plate XXIV



R. Scot Sculp. Philad.

PART III. OF THE ABDOMEN, OR LOWER BELLY.

88. THE abdomen, or lower belly, extends from the lower extremity of the ſternum, or the hollow, uſually called the pit of the ſtomach, and more properly *ſcrobiculus cordis,* to the lower part of the trunk.

It is diſtinguiſhed into three diviſions called *regions;* of theſe the upper one, which is called the *epigaſtric region,* begins immediately under the ſternum, and extends to within two fingers breadth of the navel, where the middle or *umbilical region* begins, and reaches to the ſame diſtance below the navel. The third, which is called the *hypogaſtric,* includes the reſt of the abdomen, as far as the os pubis.

Each of theſe regions is ſubdivided into three others; two of which compoſe the ſides, and the other the middle part of each region.

The middle part of the upper region is called *epigaſtrium,* and its two ſides *hypochondria.* The middle part of the next region is the umbilical region, properly ſo called, and its two ſides are the flanks, or iliac regions. Laſtly, the middle part of the lower region retains the name of hypogaſtrium, and its ſides are called inguina or groins. The back part of the abdomen bears the name of lumbar region.

Theſe are the diviſions of the lower belly, which are neceſſary to be held in remembrance, as they frequently occur in ſurgical and anatomical writing. We will now proceed to examine the contents of the abdomen; and after having pointed out the names and arrangement of the ſeveral viſcera contained in it, deſcribe each of them ſeparately.

After having removed the ſkin, adipoſe membrane, and abdominal muſcles, we diſcover the peritonæum or membrane that envelopes all the viſcera of the lower belly. This being opened, the firſt part that preſents itſelf is the omentum or cawl, floating on the ſurface of the inteſtines, which are likewiſe ſeen every where looſe and moiſt, and making a great number of circumvolutions through the whole cavity of the abdomen. The ſtomach is placed in the epigaſtrium, and under the ſtomach is the pancreas. The liver fills the right hypochondrium, and the ſpleen is ſituated in the left. The kidneys are ſeen about the middle of the lumbar region, and the urinary bladder and parts of generation are ſeated in the lower diviſion of the belly.

SECT. I. *Of the Peritonæum.*

89 THE peritonæum is a ſtrong ſimple membrane, by which all the viſcera of the abdomen are ſurrounded, and in ſome meaſure ſupported. Many anatomical writers, particularly Winſlow, have deſcribed it as being compoſed of two diſtinct membranous laminæ; but their deſcription ſeems to be erroneous. What perhaps appeared to be a ſecond lamina, being found to be ſimply a cellular coat, which ſends off productions to the blood-veſſels paſſing out of the abdominal cavity. The aorta and vena cava likewiſe derive a covering from the ſame membrane, which ſeems to be a part of the cellular membrane we have already deſcribed.

The peritonæum, by its productions and reduplications, envelopes the greateſt part of the abdominal viſcera. It is ſoft, and capable of conſiderable extenſion; and is kept ſmooth and moiſt by a vapour, which is conſtantly exhaling from its inner ſurface, and is returned again into the circulation by the abſorbents.

This moiſture not only contributes to the ſoftneſs of the peritonæum, but prevents the attrition, and other ill effects which would otherwiſe probably be occaſioned, by the motion of the viſcera upon each other.

When this fluid is ſupplied in too great a quantity, or the abſorbents become incapable of carrying it off, it accumulates, and conſtitutes an aſcites or dropſy of the belly; and when by any means the exhalation is diſcontinued, the peritonæum thickens, becomes diſeaſed, and the viſcera are ſometimes found adhering to each other.

The peritonæum is not a very vaſcular membrane. In a ſound ſtate it ſeems to be endued with little or no feeling, and the nerves that paſs through it appear to belong to the abdominal muſcles.

SECT. II. *Of the Omentum.*

THE omentum, epiploon, or cawl, is a double membrane, produced from the peritonæum. It is interlarded with fat, and adheres to the ſtomach, ſpleen, duodenum, and colon; from thence hanging down looſe and floating on the ſurface of the inteſtines. Its ſize is different in different ſubjects. In ſome it deſcends as low as the pelvis, and it is commonly longer at the left ſide than the right. 90

This part, the ſituation of which we have juſt now deſcribed, was the only one known to the ancients under the name of *epiploon;* but at preſent we diſtinguiſh three omenta, viz. *omentum magnum colico gaſtricum, omentum parvum hepatico gaſtricum,* and *omentum colicum.* They all agree in being formed of two very delicate laminæ, ſeparated by a thin layer of cellular membrane.

The omentum magnum colico gaſtricum, of which we have already ſpoken, derives its arteries from the ſplenic and hepatic. Its veins terminate in the vena portæ. Its nerves, which are very few, come from the ſplenic and hepatic plexus.

The omentum parvum hepatico gaſtricum, abounds leſs with fat than the great epiploon. It begins at the upper part of the duodenum, extends along the leſſer curvature of the ſtomach as far as the œſophagus, and terminates about the neck of the gall-bladder, and behind the left ligament of the liver, ſo that it covers the leſſer lobe; near the beginning of which we may obſerve a ſmall opening, firſt deſcribed by Winſlow, through which the whole pouch may eaſily be diſtended ed with air (x). The veſſels of the omentum parvum are derived chiefly from the coronary ſtomachic arteries and veins.

The omentum colicum begins at the fore part of the cœcum and right ſide of the colon. It appears as a hollow conical appendage to theſe inteſtines, and uſually terminates at the back of the omentum magnum. It ſeems to be nothing more than a membranous coat of the cœcum and colon, aſſuming a conical ſhape when diſtended with air.

The uſes of the omentum are not yet ſatisfactorily determined. Perhaps by its ſoftneſs and looſeneſs it may ſerve to prevent thoſe adheſions of the abdominal viſcera, which have been found to take place when the fat of the omentum has been much waſted. Some authors have ſuppoſed, that it aſſiſts in the preparation of bile; but this idea is founded merely on conjecture.

Sect. III. *Of the Stomach.*

91 The ſtomach is a membranous and muſcular bag, in ſhape not unlike a bagpipe, lying acroſs the upper part of the abdomen, and inclining rather more to the left than the right ſide.

It has two orifices, one of which receives the end of the œſophagus, and is called the *cardia*, and ſometimes the left and upper orifice of the ſtomach; though its ſituation is not much higher than the other, which is ſtyled the right and inferior orifice, and more commonly the *pylorus;* both theſe openings are more elevated than the body of the ſtomach.

The aliment paſſes down the œſophagus into the ſtomach through the cardia, and after having undergone the neceſſary digeſtion, paſſes out at the pylorus where the inteſtinal canal commences.

The ſtomach is compoſed of four tunics or coats, which are ſo intimately connected together that it requires no little dexterity in the anatomiſt to demonſtrate them. The exterior one is membranous, being derived from the peritonæum.—The ſecond is a muſcular tunic, compoſed of fleſhy fibres which are in the greateſt number about the two orifices.—The third is called the nervous coat, and within this is the villous or velvet-like coat which compoſes the inſide of the ſtomach.

The two laſt coats being more extenſive than the two firſt, form the folds, which are obſerved every where in the cavity of this viſcus, and more particularly about the pylorus; where they ſeem to impede the too haſty excluſion of the aliment, making a conſiderable plait, called *valvula pylori.*

The inner coat is conſtantly moiſtened by a mucus, which approaches to the nature of the ſaliva, and is called the gaſtric juice; this liquor has been ſuppoſed to be ſecreted by certain minute glands (y) ſeated in the nervous tunic, whoſe excretory ducts open on the ſurface of the villous coat.

The arteries of the ſtomach called the gaſtric arteries are principally derived from the cæliac; ſome of its veins paſs to the ſplenic, and others to the vena portæ; and its nerves are chiefly from the eighth pair or par vagum.

The account given of the tunics of the ſtomach may be applied to the whole alimentary canal; for both the œſophagus and inteſtines are, like this viſcus, compoſed of four coats.

Before we deſcribe the courſe of the aliment and the uſes of the ſtomach, it will be neceſſary to ſpeak of other parts which aſſiſt in the proceſs of digeſtion.

Sect. IV. *Of the Oeſophagus.*

92 The œſophagus or gullet is a membranous and muſcular canal, extending from the bottom of the mouth to the upper orifice of the ſtomach.—Its upper part where the aliment is received is ſhaped ſomewhat like a funnel, and is called the *pharynx.*

From hence it runs down cloſe to the bodies of the vertebræ as far as the diaphragm, in which there is an opening through which it paſſes, and then terminates in the ſtomach about the eleventh or twelfth vertebra of the back.

The œſophagus is plentifully ſupplied with arteries from the external carotid, bronchial, and ſuperior intercoſtal arteries; its veins empty themſelves into the vena azygos, internal jugular, and mammary veins, &c.

Its nerves are derived chiefly from the eighth pair.

We likewiſe meet with a mucus in the œſophagus, which every where lubricates its inner ſurface, and tends to aſſiſt in deglutition.—This mucus ſeems to be ſecreted by very minute glands, like the mucus in other parts of the alimentary canal.

Sect. V. *Of the Inteſtines.*

93 The inteſtines form a canal, which is uſually ſix times longer than the body to which it belongs. This canal extends from the pylorus, or inferior orifice of the ſtomach, to the anus.

It will be eaſily underſtood, that a part of ſuch great length muſt neceſſarily make many circumvolutions, to be confined with ſo many other viſcera within the cavity of the lower belly.

Although the inteſtines are in fact, as we have obſerved, only one long and extenſive canal, yet different parts have been diſtinguiſhed by different names.

The inteſtines are firſt diſtinguiſhed into two parts, one of which begins at the ſtomach, and is called the *thin* or *ſmall inteſtines*, from the ſmall ſize of the canal, when compared with the other part, which is called the *large inteſtines*, and includes the lower portion of the canal down to the anus.

Each of theſe parts has its ſubdiviſions.—The ſmall in-

(x) This membranous bag, though excedingly thin and tranſparent, is found capable of ſupporting mercury, thrown into it by the ſame channel.

(y) Heiſter, ſpeaking of theſe glands, very properly ſays, "in *porcis* facile, in *homine* raro obſervantur;" for although many anatomical writers have deſcribed their appearance and figure, yet they do not ſeem to have been hitherto ſatisfactorily demonſtrated in the human ſtomach; and the gaſtric juice is now more generally believed to be derived from the exhalent arteries of the ſtomach.

inteſtines being diſtinguiſhed into duodenum, jejunum, and ilium, and the larger portion into cœcum, colon, and rectum.

The ſmall inteſtines fill the middle and fore parts of the belly, while the large inteſtines fill the ſides and both the upper and lower parts of the cavity.

The duodenum, which is the firſt of the ſmall inteſtines, is ſo called, becauſe it is about 12 inches long. It begins at the pylorus and terminates in the jejunum, which is a part of the canal obſerved to be uſually more empty than the other inteſtines.—This appearance gives it its name, and likewiſe ſerves to point out where it begins.

The next diviſion is the ilium, which of itſelf exceeds the united length of the duodenum and jejunum, and has received its name from its numerous circumvolutions. The large circumvolution of the ilium covers the firſt of the large inteſtines called the *cæcum* (x), which ſeems properly to belong to the colon, being a kind of pouch of about four fingers in width, and nearly of the ſame length, having exteriorly a little appendix, called *appendix cæci.*

The cœcum is placed in the cavity of the os ilium on the right ſide, and terminates in the colon, which is the largeſt of all the inteſtines.

This inteſtine aſcends by the right kidney to which it is attached, paſſes under the hollow part of the liver, and the bottom of the ſtomach, to the ſpleen, to which it is likewiſe ſecured, as it is alſo to the left kidney; and from thence paſſes down towards the os ſacrum, where, from its ſtraight courſe, the canal begins to take the name of *rectum.*

There are three ligamentous bands extending thro' the whole length of the colon, which, by being ſhorter than its two inner coats, ſerve to increaſe the plaits on the inner ſurface of this gut.

The *anus* which terminates the inteſtinum rectum, is furniſhed with three muſcles; one of theſe is compoſed of circular fibres, and from its uſe in ſhutting the paſſage of the anus is called *ſphincter ani.*

The other two are the *levatores ani*, ſo called, becauſe they elevate the anus after dejection. When theſe by palſy, or any other diſeaſe, loſe the power of contracting, the anus prolapſes; and when the ſphincter is affected by ſimilar cauſes, the fæces are voided involuntarily.

It has been already obſerved, that the inteſtinal canal is compoſed of four tunics; but it remains to be remarked, that here, as in the ſtomach, the two inner tunics being more extenſive than the other two, form the plaits which are to be ſeen in the inner ſurface of the inteſtines, and are called *valvulæ conniventes.*

Some authors have conſidered theſe plaits as tending to retard the motion of the fæces, in order to afford more time for the ſeparation of the chyle; but there are others who attribute to them a different uſe: they contend, that theſe valves, by being naturally inclined downwards, cannot impede the deſcent of the fæces, but that they are intended to prevent their return upwards.

They are probably deſtined for both theſe uſes; for although theſe folds incline to their lower ſide, yet the inequalities they occaſion in the canal are ſufficient to retard, in ſome meaſure, the progreſſive motion of the fæces, and to afford a greater ſurface for the abſorption of chyle, and their natural poſition ſeems to oppoſe itſelf to the return of the aliment.

Beſides theſe *valvulæ conniventes*, there is one more conſiderable than the reſt, called the *valve of the colon*; which is found at that part of the canal where the inteſtinum ilium is joined to the colon. This valve permits the alimentary pulp to paſs downwards, but ſerves to prevent its return upwards; and it is by this valve, that glyſters are prevented from paſſing into the ſmall inteſtines (y).

Of the little vermiform appendix of the cœcum, it will be ſufficient to ſay, that its uſes have never yet been aſcertained. In birds we meet with two of theſe appendices.

The inteſtines are lubricated by a conſtant ſupply of mucus, which is probably ſecreted by very minute follicles (z). This mucus promotes the deſcent of the alimentary pulp, and in ſome meaſure defends the inner ſurface of the inteſtines from the irritation to which it would, perhaps, otherwiſe be continually expoſed from the aliment; and which, when in a certain degree, excites a painful diſorder called *colic*, a name given to the diſeaſe, becauſe its moſt uſual ſeat is in the inteſtinum colon.

The inteſtines are likewiſe frequently diſtended with air, and this diſtenſion ſometimes occaſions pain, and conſtitutes the flatulent colic.

The arteries of the inteſtines are continuations of the meſenteric arteries, which are derived in two conſiderable branches from the aorta.—The redundant blood is carried back into the vena portarum.

In the rectum the veins are called *hemorrhoidal*, and are there diſtinguiſhed into internal and external: the firſt are branches of the inferior meſenteric vein, but the latter paſs into other veins. Sometimes theſe veins are diſtended with blood from obſtructions, from weakneſs of their coats, or from other cauſes, and what we call the *hæmorrhoids* takes place. In this diſeaſe they are ſometimes ruptured; and the diſcharge of blood which conſequently follows, has probably occaſioned them to be called *hæmorrhoidal veins*.

(x) Anatomiſts have differed with reſpect to this diviſion of the inteſtines.—The method here followed is now generally adopted; but there are authors who allow the name of *cæcum* only to the little appendix, which has likewiſe been called the *vermiform appendix*, from its reſemblance to a worm in ſize and length.

(y) This is not invariably the caſe, for the contents of a glyſter have been found not only to reach the ſmall inteſtines, but to be voided at the mouth. Such inſtances, however, are not common.

(z) Some writers have diſtinguiſhed theſe glands into miliary, lenticular, &c.—Brunner and Peyer were the firſt anatomiſts who deſcribed the glands of the inteſtines, and their deſcriptions were chiefly taken from animals, theſe glandular appearances not ſeeming to have been hitherto ſatisfactorily pointed out in the human ſubject.—It is now pretty generally believed, that the mucus which everywhere lubricates the alimentary canal, is exhaled from the minute ends of arteries; and that theſe extremities firſt open into a hollow veſicle, from whence the depoſited juice of ſeveral branches flows out through one common orifice.

The nerves of the inteſtines are derived from the eighth pair.

SECT. VI. *Of the Meſentery.*

94 THE name of the *meſentery* implies its ſituation amidſt the inteſtines. It is in fact a part of the peritonæum, being a reduplication (A) of that membrane from each ſide of the lumbar vertebræ, to which it is firmly attached, ſo that it is formed of two laminæ, connected to each other by cellular membrane.

The inteſtines, in their different circumvolutions, form a great number of arches, and the meſentery accompanies them through all theſe turns; but by being attached only to the hollow part of each arch, it is found to have only a third of the extent of the inteſtines.

That part of this membrane which accompanies the ſmall inteſtines is the *meſentery*, properly ſo called; but thoſe parts of it which are attached to the colon and rectum are diſtinguiſhed by the names of *meſo-colon* and *meſo-rectum*.

There are many conglobate glands diſperſed through this double membrane, through which the lacteals and lymphatics paſs in their way to the thoracic duct. The blood-veſſels of the meſentery were deſcribed in ſpeaking of the inteſtines.

This membrane, by its attachment to the vertebræ, ſerves to keep the inteſtines in their natural ſituation. The idea uſually formed of the colic called *miſerere*, is perfectly erroneous; it being impoſſible that the inteſtines can be twiſted, as many ſuppoſe they are, in that diſeaſe, their attachment to the meſentery effectually preventing ſuch an accident—but a diſarrangement ſometimes takes place in the inteſtinal canal itſelf, which is productive of diſagreeable and ſometimes fatal conſequences.—This is by an introſuſception of the inteſtine, an idea of which may be eaſily formed, by taking the finger of a glove, and involving one part of it within the other.

If inflammation takes place, the ſtricture in this caſe is increaſed, and the periſtaltic motion of the inteſtines (by which is meant the progreſſive motion of the fæces downwards) is inverted, and what is called the *iliac paſſion* takes place. The ſame effects may be occaſioned by a deſcent of the inteſtine, or of the omentum either with it or by itſelf, and thus conſtituting what is called an *hernia rupture*; a term by which in general is meant the falling down or protruſion of any part of the inteſtine or omentum, which ought naturally to be contained within the cavity of the belly.

To convey an idea of the manner in which ſuch a deſcent takes place, it will be neceſſary to obſerve, that the lower edge of the tendon of the muſculus obliquus externus, is ſtretched from the fore-part of the os ilium or haunch-bone of the os pubis, and conſtitutes what is called *Poupart's* or *Fallopius's ligament*, forming an opening, through which paſs the great crural artery and vein. Near the os pubis the ſame tendinous fibres are ſeparated from each other, and form an opening on each ſide, called the *abdominal ring*, through which the ſpermatic veſſels paſs in men, and the ligamenta uteri in women. In conſequence of violent efforts, or perhaps of natural cauſes, the inteſtines are found ſometimes to paſs through theſe openings; but the peritonæum which incloſes them when in their natural cavity, ſtill continues to ſurround them even in their deſcent. This membrane does not become torn or lacerated by the violence, as might be eaſily imagined; but its dilatibility enables it to paſs out with the viſcus, which it incloſes as it were in a bag, and thus forms what is called the *hernial ſac*.

If the hernia be under Poupart's ligament, it is called *femoral*; if in the groin, *inguinal* (B); and *ſcrotal*, if in the ſcrotum. Different names are likewiſe given to the hernia as the contents of the ſac differ, whether of omentum only or inteſtine, or both:—but theſe definitions more properly belong to the province of ſurgery.

SECT. VII. *Of the Pancreas.*

THE pancreas is a conglomerate gland placed behind the bottom of the ſtomach, towards the firſt vertebra of the loins; ſhaped like a dog's tongue, with its point ſtretched out towards the ſpleen, and its other end extending towards the duodenum. It is about eight fingers breadth in length, two or three in width, and one in thickneſs. 95

This viſcus, which is of a yellowiſh colour, ſomewhat inclined to red, is covered with a membrane which it derives from the peritonæum. Its arteries, which are rather numerous than large, are derived chiefly from the ſplenic and hepatic, and its veins paſs into the veins of the ſame name.—Its nerves are derived from the intercoſtal.

The many little glands of which it has been obſerved the pancreas is compoſed, all ſerve to ſecrete a liquor called the *pancreatic juice*, which in its colour, conſiſtence, and other properties, does not ſeem to differ from the ſaliva. Each of theſe glands ſends out a little excretory duct, which, uniting with others, help to form larger ducts; and all theſe at laſt terminate in one common excretory duct (firſt diſcovered by Virtſungus in

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(A) He who only reads of the reduplication of membranes, will perhaps not eaſily underſtand how the peritonæum and pleura are reflected over the viſcera in their ſeveral cavities; for one of theſe ſerves the ſame purpoſes in the thorax that the other does in the abdomen. This diſpoſition, for the diſcovery of which we are indebted to modern anatomiſts, conſtitutes a curious part of anatomical knowledge: but the ſtudent, unaided by experience, and aſſiſted only by what the limits of this work would permit us to ſay on the occaſion, would probably imbibe only confuſed ideas of the matter; and it will perfectly anſwer the preſent purpoſe, if he conſiders the meſentery as a membrane attached by one of its ſides to the lumbar vertebræ, and by the other to the inteſtines.

(B) The hernia congenita will be conſidered with the male organs of generation, with which it is intimately connected.

in 1642), which runs through the middle of the gland, and is now uſually called *ductus pancreaticus Virtſungi.* This canal opens into the inteſtinum duodenum, ſometimes by the ſame orifice with the biliary duct, and ſometimes by a diſtinct opening. The liquor it diſcharges being of a mild and inſipid nature, ſerves to dilute the alimentary pulp, and to incorporate it more eaſily with the bile.

Sect. VIII. *Of the Liver.*

96. The liver is a viſcus of conſiderable ſize, and of a reddiſh colour; convex ſuperiorly and anteriorly where it is placed under the ribs and diaphragm, and of an unequal ſurface poſteriorly. It is chiefly ſituated in the right hypochondrium, and under the falſe ribs; but it likewiſe extends into the epigaſtric region, where it borders upon the ſtomach. It is covered by a production of the peritonæum, which ſerves to attach it by three of its reduplications to the falſe ribs. Theſe reduplications are called *ligaments*, though very different in their texture from what are called by the ſame name in other parts of the body. The umbillical cord, too, which in the fœtus is pervious, gradually becomes a ſimple ligament after birth; and, by paſſing to the liver, ſerves likewiſe to ſecure it in its ſituation.

At the poſterior part of this organ where the umbillical veſſels enter, it is found divided into two lobes. Of theſe, the largeſt is placed in the right hypochondrium; the other, which covers part of the ſtomach, is called the *little lobe*. All the veſſels which go to the liver paſs in at the fiſſure we have mentioned; and the production of the peritonæum, which inveſts the liver, was deſcribed by Gliſſon, an Engliſh anatomiſt, as accompanying them in their paſſage, and ſurrounding them like a glove; hence this production has been commonly known by the name of *capſula of Gliſſon:* but it appears to be chiefly a continuation of the cellular membrane which covers the vena porta ventralis.

The liver was conſidered by the ancients as an organ deſtined to prepare and perfect the blood; but later diſcoveries have proved, that this opinion was wrong, and that the liver is a glandular ſubſtance formed for the ſecretion of the bile.

The blood is conveyed to the liver by the hepatic artery and the vena porta. This is contrary to the mode of circulation in other parts, where veins only ſerve to carry off the redundant blood: but in this viſcus the hepatic artery, which is derived from the cæliac, is principally deſtined for its nouriſhment; and the vena porta, which is formed by the union of the veins from moſt of the abdominal viſcera, furniſhes the blood from which the bile is chiefly to be ſeparated; ſo that theſe two ſeries of veſſels ſerve very diſtinct purpoſes. The vena porta, as it is ramified through the liver, performs the office both of a vein and an artery; for like the former it returns the blood from the extremities of arteries, while as the latter it prepares it for ſecretion.

The nerves of the liver are branches of the intercoſtal and par vagum. The bile, after being ſeparated from the maſs of blood, in a manner of which mention will be made in another place, is conveyed out of this organ by very minute excretory ducts, called *poribiliarii;* theſe uniting together like the excretory ducts in the pancreas, gradually form larger ones, which at length terminate in a conſiderable canal called *ductus hepaticus*.

Sect. IX. *Of the Gall-bladder.*

The gall-bladder is a little membranous bag, ſhaped like a pear, and attached to the poſterior and almoſt inferior part of the great lobe of the liver. 97.

It has two tunics; of which the exterior one is a production of the peritonæum. The interior, orvillous coat, is ſupplied with a mucus that defends it from the acrimony of the bile. Theſe two coverings are intimately connected by means of cellular membrane, which from its firm gliſtening appearance has generally been ſpoken of as a muſcular tunic.

The gall-bladder is ſupplied with blood-veſſels from the hepatic arteries. Theſe branches are called the *cyſtic arteries*, and the cyſtic veins carry back the blood.

Its nerves are derived from the ſame origin as thoſe of the liver.

The neck of the gall-bladder is continued in the form of a canal called *ductus cyſticus*, which ſoon unites with the ductus hepaticus we deſcribed as the excretory duct of the liver; and forming one common canal, takes the name of *ductus coledochus communis*, through which both the cyſtic and hepatic bile are diſcharged into the duodenum. This canal opens into the inteſtine in an oblique direction, firſt paſſing through the exterior tunic, and then piercing the other coats after running between each of them a very little way. This œconomy ſerves two uſeful purpoſes;—to promote the diſcharge of bile and to prevent its return.

98 Of the bile. The bile may be defined to be a natural liquid ſoap, ſomewhat unctuous and bitter, and of a yellowiſh colour, which eaſily mixes with water, oil, and vinous ſpirits, and is capable of diſſolving reſinous ſubſtances. From ſome late experiments made by M. Cadet*, it appears to be formed of an animal oil, combined with the alkaline baſe of ſea-ſalt, a ſalt of the nature of milk, and a calcareous earth which is ſlightly ferruginous.

Its definition ſeems ſufficiently to point out the uſes for which it is intended (c). It blends the alimentary maſs, by dividing and attenuating it; corrects the too great diſpoſition to aceſcency, which the aliment acquires in the ſtomach; and, finally, by its acrimony, tends to excite the periſtaltic motion of the inteſtines.

After what has been ſaid, it will be conceived that there are two ſorts of bile; one of which is derived immediately from the liver through the hepatic duct, and the other from the gall-bladder. Theſe two biles, however, do not eſſentially differ from each other. The hepatic bile indeed is milder, and more liquid than the cyſtic, which is conſtantly thicker and yellower;

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* *Mem. de l'Acad. des Sciences.* 1767.

(c) The ancients, who were not acquainted with the real uſe of the liver, conſidered the bile as an excrementitious and uſeleſs fluid.

and by being bitterer, ſeems to poſſeſs greater activity than the other.

Every body knows the ſource of the hepatic bile, that it is ſecreted from the maſs of blood by the liver; but the origin of the cyſtic bile has occaſioned no little controverſy amongſt anatomical writers. There are ſome who contend, that it is ſeparated in the ſubſtance of the liver, from whence it paſſes into the gall-bladder through particular veſſels. In deer, and in ſome other quadrupeds, as well as in ſeveral birds and fiſhes, there is an evident communication, by means of particular veſſels, between the liver and the gall-bladder. Bianchi, Winſlow, and others, have aſſerted the exiſtence of ſuch veſſels in the human ſubject, and named them *hepaticyſtic ducts;* but it is certain that no ſuch ducts exiſt.—In obſtructions of the cyſtic duct, the gall-bladder has been found ſhrivelled and empty: ſo that we may conſider the gall-bladder as a reſervoir of hepatic bile; and that it is an eſtabliſhed fact, that the whole of the bile contained in the gall-bladder is derived from the liver; that it paſſes from the hepatic to the cyſtic duct, and from that to the gall-bladder. The difference in the colour, conſiſtence, and taſte of the bile, is merely the conſequence of ſtagnation and abſorption. When the ſtomach is diſtended with aliment, this reſervoir undergoes a certain degree of compreſſion, and the bile paſſes out into the inteſtinal canal; and in the efforts to vomit, the gall-bladder ſeems to be conſtantly affected, and at ſuch times diſcharges itſelf of its contents.

Sometimes the bile concretes in the gall-bladder, ſo as to form what are called *gall-ſtones* (D). When theſe concretions paſs into the cyſtic duct, they ſometimes occaſion exquiſite pain, by diſtending the canal in their way to the duodenum; and by lodging in the ductus choledochus communis, and obſtructing the courſe of the bile, this fluid will be abſorbed, and by being carried back into the circulation occaſion a temporary jaundice.

SECT. X. *Of the Spleen.*

99. THE ſpleen is a ſoft and ſpongy viſcus, of a bluiſh colour, and about five or ſix fingers breadth in length, and three in width, ſituated in the left hypochondrium, between the ſtomach and the falſe ribs. That ſide of it which is placed on the ſide of the ribs is convex; and the other, which is turned toward the ſtomach, is concave.

The ſplenic artery, which is a branch from the cæliac, ſupplies this viſcus with blood, and a vein of the ſame name carries it back into the vena porta.

Its nerves are derived from a particular plexus called the *ſplenic,* which is formed by branches of the intercoſtal nerve, and by the eighth pair, or par vagum.

The ancients, who ſuppoſed two ſorts of bile, conſidered the ſpleen as the receptacle of what they called *atra bilis.* Havers, who wrote profeſſedly on the bones, determined its uſe to be that of ſecreting the ſynovia; and the late Mr Hewſon imagined, that it concurred with the thymus and lymphatic glands of the body in forming the red globules of the blood. All theſe opinions ſeem to be equally fanciful. The want of an excretory duct has occaſioned the real uſe of this viſcus to be ſtill doubtful. Perhaps the blood undergoes ſome change in it, which may aſſiſt in the preparation of the bile. This is the opinion of the generality of modern phyſiologiſts; and the great quantity of blood with which it is ſupplied, together with the courſe of its veins into the vena portæ, ſeem to render this notion probable.

SECT. XI. *Of the Glandulæ Renales, Kidneys, and Ureters.*

THE glandulæ renales, which were by the ancients ſuppoſed to ſecrete the atra bilis, and by them named *capſulæ atrabilares,* are two flat bodies of an irregular figure, one on each ſide between the kidney and the aorta. 100.

In the fœtus they are as large as the kidneys: but they do not increaſe afterwards in proportion to thoſe parts; and in adults and old people they are generally found ſhrivelled, and much waſted. They have their arteries and veins. Their arteries uſually ariſe from the ſplenic or the emulgent, and ſometimes from the aorta; and their veins go to the neighbouring veins, or to the vena cava. Their nerves are branches of the intercoſtal.

The uſe of theſe parts is not yet perfectly known. In the fœtus the ſecretion of urine muſt be in a very ſmall quantity, and a part of the blood may perhaps then paſs through theſe channels, which in the adult is carried to the kidneys to ſupply the matter of urine.

101. Kidneys. The kidneys are two in number, ſituated one on the right and the other on the left ſide in the lumbar region, between the laſt falſe rib and the os ilium, by the ſides of the vertebræ. Each kidney in its figure reſembles a ſort of bean, which from its ſhape is called *kidney-bean.* The concave part of each kidney is turned towards the aorta and vena cava aſcendens. They are ſurrounded by a good deal of fat, and receive a coat from the peritonæum; and when this is removed, a very fine membrane is found inveſting their ſubſtance and the veſſels which ramify through them.

Each kidney has a conſiderable artery and vein, which are called the *emulgent.* The artery is a branch from the aorta, and the vein paſſes into the vena cava. Their nerves, which every where accompany the blood-veſſels, ariſe from a conſiderable plexus, which is derived from the intercoſtal.

In each kidney, which in the adult is of a pretty firm texture, there are three ſubſtances to be diſtinguiſhed (E). The outer part is glandular or cortical, beyond

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(D) Theſe concretions ſometimes remain in the gall-bladder without cauſing any uneaſineſs. Dr Heberden relates, that a gall-ſtone weighing two drams was found in the gall-bladder of the late Lord Bath, though he had never complained of the jaundice, nor of any diſorder which he could attribute to that cauſe. *Med. Tranſ.* Vol. ii.

(E) The kidneys in the fœtus are diſtinctly lobulated; but in the adult they become perfectly firm, ſmooth, and regular.

beyond this is the vaſcular or tubular ſubſtance, and the inner part is papillary or membranous.

It is in the cortical part of the kidney that the ſecretion is carried on; the urine being here received from the minute extremities of the capillary arteries, is conveyed out of this cortical ſubſtance by an infinite number of very ſmall cylindrical canals or excretory veſſels, which conſtitute the tubular part. Theſe tubes, as they approach the inner ſubſtance of the kidney, gradually unite together; and thus forming larger canals, at length terminate in ten or twelve little protuberances called *papillæ*, the orifices of which may be ſeen without the aſſiſtance of glaſſes. Theſe papillæ open into a ſmall cavity or reſervoir called the *pelvis of the kidney*, and formed by a diſtinct membranous bag which embraces the papillæ. From this pelvis the urine is conveyed through a membranous canal which paſſes out from the hollow ſide of the kidney, a little below the blood veſſels, and is called *ureter*.

101 Ureters. The ureters are each about as large as a common writing-pen. They are ſomewhat curved in their courſe from the kidneys, like the letter *ſ*, and at length terminate in the poſterior and almoſt inferior part of the bladder, at ſome diſtance from each other. They paſs into the bladder in the ſame manner as the ductus choledochus communis paſſes into the inteſtinum duodenum, not by a direct paſſage, but by an oblique courſe between the two coats; ſo that the diſcharge of urine into the bladder is promoted, whilſt its return is prevented. Nor does this mode of ſtructure prevent the paſſage of fluids only from the bladder into the ureters, but likewiſe air:—for air thrown into the bladder inflates it, and it continues to be diſtended if a ligature is paſſed round its neck; which ſeems to prove ſufficiently that it cannot paſs into the ureters.

Sect. XII. *Of the Urinary Bladder.*

102 The urinary bladder is a membranous and muſcular bag of an oblong roundiſh ſhape, ſituated in the pelvis, between the os pubis and inteſtinum rectum in men, and between the os pubis and uterus in women. Its upper and wideſt part is uſually called the *bottom*, its narrow part the *neck* of the bladder; the former only is covered by the peritonæum.

The bladder is formed of three coats, connected together by means of cellular membrane. The external or peritonæal, is only a partial one, covering the upper and back part of the bladder. The middle, or muſcular coat, is compoſed of irritable, and of courſe muſcular fibres, which are moſt collected around the neck of the bladder, but not ſo as to form a diſtinct muſcle, or ſphincter, as the generality of anatomiſts have hitherto ſuppoſed.

The inner coat, though much ſmoother, has been ſaid to reſemble the villous tunic of the inteſtines, and like that is provided with a mucus, which defends it againſt the acrimony of the urine.

103 Of the urine. It will be eaſily conceived from what has been ſaid, that the kidneys are two glandular bodies, thro' which a ſaline and excrementitious fluid called *urine* is conſtantly filtering from the maſs of blood.

While only a ſmall quantity of urine is collected in the bladder, it excites no kind of uneaſineſs; but when a greater quantity is accumulated, ſo that the bladder is diſtended in a certain degree, it excites in us a certain ſenſation, which brings on as it were a voluntary contraction of the bladder to promote its diſcharge.—But this contraction is not effected by the muſcular fibres of the bladder alone: for all the abdominal muſcles contract in obedience to our will, and preſs downwards all the viſcera of the lower belly; and theſe powers being united, at length overcome the reſiſtance of the fibres ſurrounding the neck of the bladder, which dilates and affords a paſſage to the urine through the urethra.

The frequency of this evacuation depends on the quantity of urine ſecreted; on the degree of acrimony it poſſeſſes; on the ſize of the bladder, and on its degree of ſenſibility.

The urine varies much in its colour and contents. Theſe varieties depend, on age, ſex, climate, diet, and other circumſtances. In infants it is generally a clear watery fluid, without ſmell or taſte. As we advance in life, it acquires more colour and ſmell, and becomes more impregnated with ſalts. In old people it becomes ſtill more acrid and fetid.

In a healthy ſtate it is nearly of a ſtraw colour.—After being kept for ſome time, it depoſites a tartarous matter, which is found to be compoſed chiefly of earth and ſalt, and ſoon incruſts the ſides of the veſſel in which it is contained. While this ſeparation is taking place, appearances like minute fibres or threads of a whitiſh colour, may be ſeen in the middle of the urine, and an oily ſcum obſerved floating on its ſurface. So that the moſt common appearances of the urine are ſufficient to aſcertain that it is a watery ſubſtance, impregnated with earthy, ſaline, and oily particles.

The urine is not always voided of the ſame colour and conſiſtence; for theſe are found to depend on the proportion of its watery part to that of its other conſtituent principles.—Its colour and degree of fluidity ſeem to depend on the quantity of ſaline and inflammable particles contained in it: ſo that an increaſed proportion of thoſe parts will conſtantly give the urine a higher colour, and add to the quantity of ſediment.

The variety in the appearance of the urine, depends on the nature and quantity of ſolid and fluid aliment we take in; and it is likewiſe occaſioned by the different ſtate of the urinary veſſels, by which we mean the channels through which it is ſeparated from the blood, and conveyed through the pelvis into the ureters. The cauſes of calculous concretions in the urinary paſſages, are to be looked for in the natural conſtitution of the body, mode of life, &c.

It having been obſerved, that after drinking any light wine or Spa water, it very ſoon paſſed off by urine, it has been ſuppoſed by ſome, that the urine is not altogether conveyed to the bladder by the ordinary courſe of circulation, but that there muſt certainly exiſt ſome other ſhorter means of communication, perhaps by certain veſſels between the ſtomach and the bladder, or by a retrograde motion in the lymphatics. But it is certain, that if we open the belly of a dog, preſs out the urine from the bladder, paſs a ligature round the emulgent arteries, and then ſew up the abdomen, and give him even the moſt diuretic liquor to drink, the ſtomach and other channels will be diſtended with it, but not a drop of urine will be found to have paſſed into the bladder ; or the ſame thing happens when a ligature is thrown round the two ureters. This experiment then ſeems to be a ſufficient proof, that all the urine we evacuate, is conveyed to the kidneys through the emulgent arteries, in the manner we have deſcribed.—It is true, that wine and other liquors promote a ſpeedy evacuation of urine : but the diſcharge ſeems to be merely the effect of the ſtimulus they occaſion ; by which the bladder and urinary parts are ſolicited to a more copious diſcharge of the urine, which was before in the body, and not immediately of that which was laſt drank ; and this increaſed diſcharge, if the ſupply is kept up, will continue : nor will this appear wonderful, if we conſider the great capacity of the veſſels that go to the kidneys ; the conſtant ſupply of freſh blood that is eſſential to health ; and the rapidity with which it is inceſſantly circulated through the heart to all parts of the body.

Sect. XIII. *Of Digeſtion.*

102. We are now proceeding to ſpeak of *digeſtion,* which ſeems to be introduced in this place with propriety, after a deſcription of the abdominal viſcera, the greater part of which contribute to this function. By *digeſtion* is to be underſtood, the changes the aliment undergoes for the formation of chyle :—theſe changes are effected in the mouth, ſtomach, and ſmall inteſtines.

The mouth, of which every body has a general knowledge, is the cavity between the two jaws, formed anteriorly and laterally by the lips, teeth, and cheeks, and terminating poſteriorly in the throat.

The lips and cheeks are made up of fat and muſcles, covered by the cuticle, which is continued over the whole inner ſurface of the mouth, like a fine and delicate membrane.—Beſide this membrane, the inſide of the mouth is furniſhed with a ſpongy and very vaſcular ſubſtance called the *gums,* by means of which the teeth are ſecured in their ſockets. A ſimilar ſubſtance covers the roof of the mouth, and forms what is called the *velum pendulum palati,* which is fixed to the extremity of the arch formed by the oſſa maxillaria and oſſa palati, and terminates in a ſoft, ſmall, and conical body, named *uvula ;* which appears, as it were, ſuſpended from the middle of the arch over the baſis of the tongue.

The velum pendulum palati performs the office of a valve between the cavity of the mouth and the pharynx, being moved by ſeveral muſcles (F).

The tongue is compoſed of ſeveral muſcles (G) which enable it to perform a variety of motions for the articulation of the voice ; for the purpoſes of maſtication ; and for conveying the aliment into the pharynx. Its upper part is covered with papillæ, which conſtitute the organ of taſte, and are eaſily to be diſtinguiſhed ; it is covered by the ſame membrane that lines the inſide of the mouth, and which makes at its inferior part towards its baſis a reduplication called *frœnum.*

Poſteriorly, under the velum palati, and at the baſis of the tongue, is the pharynx : which is the beginning of the œſophagus, ſtretched out every way, ſo as to reſemble the top of a funnel, through which the aliment paſſes into the ſtomach.

The mouth has a communication with the noſtrils at its poſterior and upper part ; with the ears, by the Euſtachian tubes ; with the lungs, by means of the larynx ; and with the ſtomach, by means of the œſophagus.

The pharynx is conſtantly moiſtened by a fluid, ſecreted by two conſiderable glands called the *tonſils,* one on each ſide of the velum palati. Theſe glands, from their ſuppoſed reſemblance to almonds, have likewiſe been called *amygdalus.*

The mouth is moiſtened by a conſiderable quantity of ſaliva. This fluid is derived from the *parotid glands ;* a name which by its etymology points out their ſituation to be near the ears. They are two in number, one on each ſide under the os malæ : and they are of the conglomerate kind ; being formed of many ſmaller glands, each of which ſends out a very ſmall excretory duct, which unites with the reſt, to form one common channel, that runs over the cheek, and piercing the buccinator muſcle, opens into the mouth on each ſide, by an orifice into which a briſtle may be eaſily introduced. —Beſides theſe, the maxillary glands, which are placed near the inner ſurface of the angle of the lower jaw on each ſide ; the ſublingual glands, which are ſituated at the root of the tongue ; the glands of the palate, which are ſeated in the velum palati ; and thoſe of the cheeks, lips, &c. together with many other leſs conſiderable ones,—pour the ſaliva into the mouth through their ſeveral excretory ducts.

The ſaliva, like all the other humours of the body, is found to be different in different people : but in general, it is a limpid and inſipid fluid, without ſmell in healthy ſubjects ; and theſe properties would ſeem to prove that it contains very few ſaline or inflammable particles.

The uſes of the ſaliva ſeem to be to moiſten and lubricate the mouth, and to aſſiſt in reducing the aliment into a ſoft pulp before it is conveyed into the ſtomach.

103 Of hunger and thirſt.

The variety of functions which are conſtantly performed by the living body, muſt neceſſarily occaſion a continual waſte and diſſipation of its ſeveral parts. A great quantity is every day thrown off by the inſenſible perſpiration and other diſcharges ; and were not theſe loſſes conſtantly recruited by a freſh ſupply of chyle, the body would ſoon effect its own diſſolution. But nature has very wiſely favoured us with organs fitted to produce ſuch a ſupply ; and has at the ſame time endued us with the ſenſations of hunger and thirſt, that our attention may not be diverted from the neceſſary buſineſs of nutrition. The ſenſation of hunger is univerſally

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(F) Theſe are the circumflexus palati, levator palati mollis, palato-pharyngæus conſtrictor iſthmi faucium and azygos uvulæ. See page 708.

(G) Theſe are, the genio-gloſſus, hyo-gloſſus, lingualis, and ſtylo-gloſſus. See page 708.

verſally known; but it would perhaps be difficult to deſcribe it perfectly in words. It may, however, be defined to be a certain uneaſy ſenſation in the ſtomach, which induces us to wiſh for ſolid food; and which likewiſe ſerves to point out the proper quantity, and time for taking it. In deſcribing the ſtomach, mention was made of the gaſtric juice, as every where lubricating its inner coat. This humour mixes itſelf with the aliment in the ſtomach, and helps to prepare it for its paſſage into the inteſtines; but when the ſtomach is perfectly empty, this ſame fluid irritates the coats of the ſtomach itſelf, and produces the ſenſation of hunger.

A certain proportion of liquid aliment is required to aſſiſt in the proceſs of digeſtion, and to afford that moiſture to the body, of which there is ſuch a conſtant diſſipation.—Thirſt induces us to take this neceſſary ſupply of drink; and the ſeat of this ſenſation is in the tongue, fauces, and œſophagus, which from their great ſenſibility are required to be kept moiſt: for though the fauces are naturally moiſtened by the mucus and ſalival juices; yet the blood, when deprived of its watery part or rendered acrimonious by any natural cauſes, never fails particularly to affect theſe parts, and the whole alimentary canal, and to occaſion thirſt.—This is the common effect of fevers and of hard labour, by both which too much of the watery part of the blood is diſſipated.

104
Of maſtication and deglutition.

It has been obſerved, that the aliment undergoes ſome preparation in the mouth before it paſſes into the ſtomach; and this preparation is the effect of maſtication. In treating of the upper and lower jaws, mention was made of the number and arrangement of the teeth. The upper jaw was deſcribed as being immoveable; but the lower jaw was ſpoken of as being capable of elevation and depreſſion, and of a grinding motion. The aliment, when firſt carried into the mouth, is preſſed between the teeth of the two jaws by a very ſtrong and frequent motion of the lower jaw; and the tongue and the cheeks aſſiſting in this proceſs, continue to replace the food between the teeth till it is perfectly divided, and reduced to the conſiſtence of pulp. The inciſores and canini divide it firſt into ſmaller pieces, but it is between the ſurfaces of the dentes molares by the grinding motion of the jaw that the maſtication is completed.

During this proceſs, the ſalival glands being gently compreſſed by the contraction of the muſcles that move the lower jaw, pour out their ſaliva: this helps to divide and break down the food, which at length becomes a kind of pulp, and is then carried over the baſis of the tongue into the fauces. But to effect this paſſage into the œſophagus, it is neceſſary that the other openings which were mentioned as having a communication with the mouth as well as the pharynx, ſhould be cloſed; that none of the aliment, whether ſolid or liquid, may paſs into them, whilſt the pharynx alone is dilated to receive it:—And ſuch a diſpoſition actually takes place in a manner we will endeavour to deſcribe.

The trachea arteria, or windpipe, through which the air is conveyed to the lungs, is placed before the œſophagus—in the act of ſwallowing; therefore, if the *larynx* (for ſo the upper part of the trachea is called) is not cloſed, the aliment will paſs into it in its way to the œſophagus. But this is prevented by a ſmall and very elaſtic cartilage, called *epiglottis*, which is attached only to the fore-part of the larynx; ſo that the food in its paſſage to the œſophagus preſſes down this cartilage, which then covers the glottis or opening of the larynx; and at the ſame time the velum palati being capable of ſome degree of motion, is drawn backwards by its muſcles, and cloſes the openings into the noſe and the Euſtachian tubes.—This, however, is not all. The larynx, which being compoſed of cartilaginous rings, cannot fail in its ordinary ſtate to compreſs the membranous canal of the œſophagus, is in the act of deglutition carried forwards and upwards by muſcles deſtined for that purpoſe; and conſequently drawing the fore-part of the pharynx with it, that opening is fully dilated. When the aliment has reached the pharynx, its deſcent is promoted by its own proper weight, and by the muſcular fibres of the œſophagus, which continue to contract from above downwards, until the aliment has reached the ſtomach. That theſe fibres have no inconſiderable ſhare in deglutition, any perſon may experience, by ſwallowing with his head downwards, when the deſcent of the aliment cannot poſſibly be effected by its weight.

It is neceſſary that the noſtrils and the lungs ſhould communicate with the mouth, for the purpoſes of ſpeech and reſpiration: but if the moſt minute part of our food happens to be introduced into the trachea, it never fails to produce a violent cough, and ſometimes the moſt alarming ſymptoms. This is liable to happen when we laugh or ſpeak in the act of deglutition: the food is then ſaid to have paſſed the wrong way. And indeed this is not improperly expreſſed: for death would ſoon follow, if the quantity of aliment introduced into the trachea ſhould be ſufficient to obſtruct the reſpiration only during a very ſhort time; or if the irritating particles of food ſhould not ſoon be thrown up again by means of the cough, which in theſe caſes very ſeaſonably increaſes in proportion to the degree of irritation.

If the velum palati did not cloſe the paſſage to the noſtrils, deglutition would be performed with difficulty, and perhaps not at all; for the aliment would return through the noſe, as is ſometimes the caſe in drinking. Children, from a deficiency in this velum palati, have been ſeen to die a few hours after birth; and they who from diſeaſe or any other cauſes have not this part perfect, ſwallow with difficulty.

The aliment, after having been ſufficiently divided by the action of the teeth, and attenuated by the ſaliva, is received into the ſtomach, where it is deſtined to undergo a more conſiderable change.

The properties of the aliment not being much altered at its firſt entrance into the ſtomach, and before it is thoroughly blended with the gaſtric juice, is capable of irritating the inner coat of the ſtomach to a certain degree, and occaſions a contraction of its two orifices.—In this membranous bag, ſurrounded by the abdominal viſcera, and with a certain degree of natural heat, the aliment undergoes a conſtant agitation by means of the abdominal muſcles and of the diaphragm, and likewiſe by a certain contraction or expanſion of the muſcular fibres of the ſtomach itſelf. By this motion, every part of the food is expoſed to the action of the gaſtric juice, which gradually divides and attenuates it, and prepares it for its paſſage into the inteſtines.

Some obſervations lately publiſhed by Mr Hunter in the Philoſophical Tranſactions, tend to throw conſiderable light on the principles of digeſtion. There are few dead bodies in which the ſtomach, at its great end, is not found to be in ſome degree digeſted (H). Animals, or parts of animals, poſſeſſed of the living principle, when taken into the ſtomach, are not in the leaſt affected by the action of that viſcus; but the moment they loſe the living principle, they become ſubject to its digeſtive powers. This ſeems to be the caſe with the ſtomach, which is enabled to reſiſt the action of its juices in the living body: but when deprived of the living principle, it is then no longer able to reſiſt the powers of that menſtruum, which it had itſelf formed for the digeſtion of its contents; the proceſs of digeſtion appearing to be continued after death. This is confirmed by what happens in the ſtomachs of fiſhes: They frequently ſwallow, without maſtication, fiſh which are larger than the digeſting parts of their ſtomach can contain; and in ſuch caſes, that part which is taken into the ſtomach is more or leſs diſſolved, while that part which remains in the œſophagus is perfectly ſound; and here, as well as in the human body, the digeſting part of the ſtomach is often reduced to the ſame ſtate as the digeſted part of the food. Theſe appearances tend to prove, that digeſtion is not effected by a mechanical power, by contractions of the ſtomach, or by heat; but by a fluid ſecreted in the coats of the ſtomach, which is poured into its cavity, and there animalizes the food, or aſſimilates it to the nature of blood.

From ſome late experiments by M. Sage,* it appears, that inflammable air has the property of deſtroying and diſſolving the animal texture: And as we ſwallow with the ſubſtances which ſerve us for food a great quantity of atmoſpherical air, M. Sage thinks it poſſible, that dephlogiſticated, which is its principle, may be converted in the ſtomach into inflammable air, or may modify into inflammable air a portion of the oily ſubſtance which is the principle of aliments. In this caſe, would not the inflammable air (he aſks), by diſſolving our food, facilitate its converſion into chyle?

* *Hiſt. de l'Academie royale des Sciences, &c.* pour 1784. mem. 15.

Be this as it may, the food, after having remained one, two, or three hours in the ſtomach, is converted into a greyiſh pulp, which is uſually called *chymus*, a word of Greek etymology, ſignifying *juice*, and ſome few milky or chylous particles begin to appear.—But the term of its reſidence in this bag is proportioned to the nature of the aliment, and to the ſtate of the ſtomach and its juices. The thinner and more perfectly digeſted parts of the food paſs by a little at a time into the duodenum, through the pylorus, the fibres of which relax to afford it a paſſage; and the groſſer and leſs digeſted particles remain in the ſtomach, till they acquire a ſufficient fluidity to paſs into the inteſtines, where the nature of the *chymus* is perfectly changed. The bile and pancreatic juice which flow into the duodenum, and the mucus, which is every where diſtilled from the ſurface of the inteſtines, mix themſelves with the alimentary pulp, which they ſtill farther attenuate and diſſolve, and into which they ſeem to infuſe new properties.

Two matters very different from each other in their nature and deſtination, are the reſult of this combination.—One of theſe, which is compoſed of the liquid parts of the aliment, and of ſome of its more ſolid particles, extremely divided and mixed with the juices we have deſcribed, conſtitutes a very mild, ſweet, and whitiſh fluid, reſembling milk, and diſtinguiſhed by the name of *chyle*. This fluid is abſorbed by the lacteal veins, which convey it into the circulation, where, by being aſſimilated into the nature of blood, it affords that ſupply of nutrition, which the continual waſte of the body is found to require.—The other, is the remains of the alimentary maſs deprived of all its nutritious particles, and containing only ſuch parts as were rejected by the abſorbing mouths of the lacteals. This groſſer part, called the *fæces*, paſſes on through the courſe of the inteſtines, to be voided at the anus, as will be explained hereafter; for this proceſs in the œconomy cannot be well underſtood till the motion of reſpiration has been explained. But the ſtructure of the inteſtines is a ſubject which may be properly deſcribed in this place, and deſerves to be attended to.

It has been already obſerved, that the inteſtinal canal is five or ſix times as long as the body, and that it forms many circumvolutions in the cavity of the abdomen, which it traverſes from the right to the left, and again from the left to the right; in one place deſcending, and in another extending itſelf upwards. It was noticed likewiſe, that the inner coat of the inteſtines, by being more capacious than their exterior tunics, formed a multitude of plaits placed at a certain diſtance from each other, and called *valvulæ conniventes*. Now this diſpoſition will be found to afford a farther proof of that divine wiſdom, which the anatomiſt and phyſiologiſt cannot fail to diſcover in all their purſuits.—For if the inteſtinal canal was much ſhorter than it naturally is; if inſtead of the preſent circumvolutions it paſſed in a direct courſe from the ſtomach; and if its inner ſurface was ſmooth and deſtitute of valves; the aliment would conſequently paſs with great rapidity to the anus, and ſufficient time would be wanting to aſſimilate the chyle, and for the neceſſary abſorption of it into the lacteals: ſo that the body would be deprived of the ſupply of nutrition, which is ſo eſſential to life and health; but the length and circumvolutions of the inteſtines, the inequality of their internal ſurface,

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(H) The Abbé Spallanzani, who has lately written upon digeſtion, finds, from a variety of experiments, made upon quadrupeds, birds, and fiſhes, that digeſtion goes on for ſome time after death, though far leſs conſiderable than in living animals; but heat is neceſſary in many animals, or at leaſt promotes it in a much greater degree. He found alſo, that when the ſtomach was cut out of the body, it had ſomewhat of the power of digeſtion, though this was trifling when compared with that which took place when the ſtomach was left in the body. In not one of the animals was the great curvature of the ſtomach diſſolved, or much eroded after death. There was often a little eroſion, eſpecially in different fiſhes; in which, when he had cleared the ſtomach of its contents, the internal coat was wanting. In other animals there was only a ſlight excoriation; and the injury face, and the courſe of the aliment through them, all concur to perfect the ſeparation of the chyle from the fæces, and to afford the neceſſary nouriſhment to the body.

SECT. XIV. *Of the Courſe of the Chyle, and of the Lymphatic Syſtem.*

105. AN infinite number of very minute veſſels, called the *lacteal veins*, ariſe like net-work from the inner ſurface of the inteſtines, (but principally from the *jejunum* and *ilium*), which are diſtended to imbibe the nutritious fluid or chyle. Theſe veſſels, which were diſcovered by Aſellius in 1622 (I), paſs obliquely through the coats of the inteſtine, and running along the meſentery, unite as they advance, and form larger branches, all of which paſs through the meſenteric or conglobate glands, which are very numerous in the human ſubject. As they run between the inteſtines and theſe glands, they are ſtyled *venæ lacteæ primis generis*: but after leaving theſe glands, they are found to be leſs numerous, and being increaſed in ſize, are then called *venæ lacteæ ſecundi generis*, which go to depoſite their contents in the *thoracic duct*, through which the chyle is conveyed into the blood.

This *thoracic duct* begins about the lower part of the firſt vertebra lumborum, from whence it paſſes up by the ſide of the aorta, between that and the vena azygos, cloſe to the vertebræ, being covered by the pleura. Sometimes it is found divided into two branches; but they uſually unite again into one canal, which opens into the left ſubclavian vein, after having run a little way in an oblique courſe between its coats. The ſubclavian vein communicates with the vena cava, which paſſes to the right auricle of the heart.

The lower part of this duct being uſually larger than any other part of it, has been named *receptaculum chyli*, or *Pecquet's receptacle*, in honour of the anatomiſt who firſt diſcovered it in 1651. In ſome quadrupeds, in turtle and in fiſh, this enlargement * is more conſiderable in proportion to the ſize of the duct, than it uſually is in the human ſubject, where it is not commonly found large enough to merit the name of *receptaculum*.

* *Hewſon's Exp. Inq.* Part II.

Opportunities of obſerving the lacteals in the human ſubject do not often occur; but they may be eaſily demonſtrated in a dog or any other quadruped that is killed two or three hours after feeding upon milk, for then they appear filled with white chyle.

But theſe *lacteals* which we have deſcribed, as paſſing from the inteſtines through the meſentery to the thoracic duct, compoſe only a part of a ſyſtem of veſſels which perform the office of *abſorption*, and which conſtitute, with their common trunk the thoracic duct, and the conglobate glands that are diſperſed through the body, what may be ſtyled the *lymphatic ſyſtem*. So that what is ſaid of the ſtructure of one of theſe ſeries of veſſels may very properly be applied to that of the other.

106 Lymphatic veſſels.

The *lymphatic veins* (K) are minute pellucid tubes, which, like the lacteals, direct their courſe towards the centre of the body, where they pour a colourleſs fluid into the thoracic duct. The lymphatics from all the lower parts of the body gradually unite as they approach this duct, into which they enter by three or four very large trunks, that ſeem to form the lower extremity of this canal, or *receptaculum chyli*, which may be conſidered as the great trunk of the lymphatic ſyſtem. The lacteals open into it near the ſame place; and the lymphatics, from a large ſhare of the upper parts of the body, pour their lymph into different parts of this duct as it runs upwards, to terminate in the left ſubclavian vein. The lymphatics from the right ſide of the neck, thorax, and right arm, &c. terminate in the right ſubclavian vein.

As the lymphatics commonly lie cloſe to the large blood-veſſels, a ligature paſſed round the crural artery in a living animal, by including the lymphatics, will occaſion a diſtenſion of theſe veſſels below the ligature, ſo as to demonſtrate them with eaſe; and a ligature paſſed round the thoracic duct, inſtantly after killing an animal, will, by ſtopping the courſe of its contents into

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jury in all of them was at the inferior part, or great curvature. The coats of the ſtomach ſuffer leſs after death than fleſh, or part of the ſtomach of ſimilar animals put into it: The author aſſigns as a reaſon for this, that theſe bodies are inveſted on all ſides by the gaſtric fluid, whereas it only acts on the internal ſurface of the ſtomach.

(I) We are informed by Galen, that the lacteals had been ſeen in kids by Eraſiſtratus, who conſidered them as arteries carrying a milky fluid: but from the remote time in which he lived, they do not ſeem to have been noticed till they were diſcovered in a living dog by Aſellius, who denominated them *lacteals*, and conſidered them as ſerving to convey the chyle from the inteſtines to the liver; for before the diſcovery of the thoracic duct, the uſe of the liver was univerſally ſuppoſed to be that of converting the chyle into blood. But the diſcovery of the thoracic duct by Pecquet, not long after, corrected this error. Pecquet very candidly confeſſes, that this diſcovery accidentally aroſe from his obſerving a white fluid, mixed with the blood, flowing out of the vena cava, after he had cut off the heart of a living dog; which he ſuſpected to be chyle, and afterwards traced to its ſource from the thoracic duct: This duct had been ſeen near an hundred years before in a horſe by Euſtachius, who ſpeaks of it as a vein of a particular ſtructure, but without knowing any thing of its termination or uſe.

(K) The arteries in their courſe through the body becoming gradually too minute to admit the red globules of the blood, have then been ſtyled *capillary* or *lymphatic arteries*. The veſſels which are here deſcribed as conſtituting the lymphatic ſyſtem, were at firſt ſuppoſed to be continued from thoſe arteries, and to convey back the lymph, either into the red veins or the thoracic duct; the office of abſorption having been attributed to the *red veins*. But we know that the *lymphatic veins* are not continuations of the *lymphatic arteries*, but that they conſtitute the *abſorbent ſyſtem*. There are ſtill, however, ſome very reſpectable names among the anatomiſts of the preſent age, who contend, that the red veins act likewiſe as abſorbents:—but it ſeems to have been clearly proved, that the red veins do abſorb nowhere but in the cavernous cells of the penis, the erection of which is occaſioned by a diſtenſion of thoſe cells with arterial blood.

into the ſubclavian vein, diſtend not only the lacteals, but alſo the lymphatics in the abdomen and lower extremities, with their natural fluids (L).

The coats of theſe veſſels are too thin to be ſeparated from each other; but the mercury they are capable of ſuſtaining, proves them to be very ſtrong; and their great power of contraction, after undergoing conſiderable diſtenſion, together with the irritability with which Baron Haller found them to be endued *, ſeems to render it probable, that, like the blood-veſſels, they have a muſcular coat.

The lymphatics are nouriſhed after the ſame manner as all the other parts of the body. For even the moſt minute of theſe veſſels are probably ſupplied with ſtill more minute arteries and veins. This ſeems to be proved by the inflammation of which they are ſuſceptible; and the painful ſwellings which ſometimes take place in lymphatic veſſels, prove that they have nerves as well as blood-veſſels.

Both the lacteals, lymphatics, and thoracic duct, are furniſhed with valves, which are much more common in theſe veſſels than in the red veins. Theſe valves are uſually in pairs, and ſerve to promote the courſe of the chyle and lymph towards the thoracic duct, and to prevent its return. Mention has been made of the glands, through which the lacteals paſs in their courſe through the meſentery; and it is to be obſerved, that the lymphatics paſs through ſimilar glands in their way to the thoracic duct. Theſe glands are all of a conglobate kind, but the changes which the chyle and lymph undergo in their paſſage through them, have not yet been aſcertained.

The *lymphatic veſſels* begin from ſurfaces and cavities in all parts of the bodies as *abſorbents*. This is a fact now univerſally allowed; but how the fluids they abſorb are poured into thoſe cavities, is a ſubject of controverſy. The contents of the abdomen, for inſtance, were deſcribed as being conſtantly moiſtened by a very thin watery fluid. The ſame thing takes place in the pericardium, pleura, and all the other cavities of the body, and this watery fluid is the *lymph*. But whether it is exhaled into thoſe cavities through the minute ends of arteries, or tranſuded through their coats, are the points in diſpute. We cannot here be permitted to relate the many ingenious arguments that have been advanced in favour of each of theſe opinions; nor is it perhaps of conſequence to our preſent purpoſe to enter into the diſpute. It will be ſufficient if the reader can form an idea of what the lymph is, and of the manner in which it is abſorbed.

The *lymph*, from its tranſparency and want of colour, would ſeem to be nothing but water; and hence the firſt diſcoverers of theſe veſſels ſtiled them *ductus aquoſi*: but experiments prove, that the lymph of an healthy animal coagulates by being expoſed to the air, or a certain degree of heat, and likewiſe by being ſuffered to reſt; ſeeming to agree in this property with that part of the blood called the *coagulable lymph*.—This property of the lymph leads to determine its uſe, in moiſtening and lubricating the ſeveral cavities of the body in which it is found; and for which, by its gelatinous principle, it ſeems to be much better calculated than a pure and watery fluid would be, for ſuch it has been ſuppoſed to be by ſome anatomiſts.

The mouths of the *lymphatics* and *lacteals*, by acting as capillary tubes, ſeem to abſorb the *lymph* and *chyle* ſomewhat in the ſame manner as a capillary tube of glaſs, when put into a baſon of water, is enabled to attract the water into it to a certain height; but it is probable that they likewiſe poſſeſs a living power, which aſſiſts in performing this office. In the human body the *lymph*, or the *chyle*, is probably conveyed upon this principle as far as the firſt pair of valves, which ſeem to be placed not far from the orifice of the abſorbing veſſel, whether *lymphatic* or *lacteal*; and the fluid will then be propelled forwards, by a continuation of the abſorption at the orifice. But this does not ſeem to be the only inducement to its progreſs towards the thoracic duct; theſe veſſels have probably a muſcular coat, which may ſerve to preſs the fluid forwards from one pair of valves to another; and as the large lymphatic veſſels and the thoracic duct are placed cloſe to the large arteries, which have a conſiderable pulſation, it is reaſonable to ſuppoſe, that they derive ſome advantages from this ſituation.

SECT. XV. *Of the Generative Organs; of Conception*, &c.

§ 1. *The Male Organs*. 107.

The male organs of generation have been uſually divided into the parts which ſerve to prepare the ſemen from the blood, and thoſe which are diſtended to convey it into the womb. But it ſeems to be more proper to diſtinguiſh them into the *preparing*, the *containing*, and the *expelling* parts, which are the different offices of the *teſtes*, the *veſiculæ ſeminales*, and the *penis*; and this is the order in which we propoſe to deſcribe them.

The teſtes are two glandular bodies, ſerving to ſecrete the ſemen from the blood. They are originally formed and lodged within the cavity of the abdomen; and it is not till after the child is born, or very near that time, that they begin to paſs into the groin, and from thence into the ſcrotum (M). By this diſpoſition they

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* *Sur le movement du ſang* Ex. 295, 298.

(L) In the dead body they may be eaſily domonſtrated by opening the artery ramifying through any viſcus, as in the ſpleen, for inſtance, and then throwing in air; by which the lymphatics will be diſtended. One of them may then be punctured, and mercury introduced into it through a blow-pipe.

(M) It ſometimes happens in diſſecting ruptures, that the inteſtine is found in the ſame ſac, and in contact with the teſtis. This appearance was at firſt attributed to a ſuppoſed laceration of the peritonæum; but later obſervations, by pointing out the ſituation of the teſticles in the fœtus, have led to prove, that the teſtis, as it deſcends into the ſcrotum, carries with it a portion or elongation of the peritonæum, which becomes its tunica vaginalis, or a kind of ſac, in which the teſticle is lodged, as will be explained in the courſe of this ſection. The communication between this ſac and the cavity of the abdomen, is uſually ſoon cut off; but in ſome ſubjects they are very wiſely protected from the injuries to which they would be liable to be expoſed, from the different poſitions of the child at the time of parturition.

The teſticles in this ſtate are looſely attached to the pſoæ muſcles, by means of the peritonæum by which they are covered; and they are at this time of life connected in a very particular manner to the parietes of the abdomen, and likewiſe to the ſcrotum, by means of a ſubſtance which Mr Hunter calls the *ligament* or *gubernaculum teſtis*, becauſe it connects the teſtis with the ſcrotum, and directs its courſe in its deſcent. This gubernaculum is of a pyramidal form, with its bulbous head fixed to the lower end of the teſtis and epididymis, and loſes its lower and ſlender extremity in the cellular membrane of the ſcrotum. It is difficult to aſcertain what the ſtructure and compoſition of this gubernaculum is, but it is certainly vaſcular and fibrous; and, from certain circumſtances, it would ſeem to be in part compoſed of the cremaſter muſcle, running upwards to join the lower end of the teſtis.

We are not to ſuppoſe that the teſticle, when deſcended into the ſcrotum, is to be ſeen looſe as a piece of gut or omentum would be in a common hernial ſac. We have already obſerved, that during its reſidence in the cavity of the abdomen it is attached to the peritoneum, which deſcends with it; ſo that when the ſac is completed in the ſcrotum, the teſticle is at firſt attached only to the poſterior part of it, while the fore part of it lies looſe, and for ſome time affords a communication with the abdomen. The ſpermatic chord, which is made up of the ſpermatic artery and vein, and of the vas deferens or excretory duct of the teſtis, is cloſely attached behind to the poſterior part of this elongation of the peritonæum. But the fore part of the peritoneal ſac, which is at firſt looſe and not attached to the teſticle, cloſes after a certain time, and becomes united to the poſterior part, and thus perfectly ſurrounds the teſticle as it were in a purſe.

The teſticles of the fœtus differ only in their ſize and ſituation from thoſe of the adult. In their paſſage from the abdomen they deſcend through the abdominal rings into the ſcrotum, where they are ſupported and defended by various integuments.

What the immediate cauſe of this deſcent is, has not yet been ſatisfactorily determined. It has been aſcribed to the effects of reſpiration, but the teſticles have ſometimes been found in the ſcrotum before the child has breathed; and it does not ſeem to be occaſioned by the action of the cremaſter muſcle, becauſe the ſame effect would be liable to happen to the hedgehog, and ſome other quadrupeds, whoſe teſticles remain in the abdomen during life.

The ſcrotum, which is the external or common covering of both teſticles, is a kind of ſac formed by the common integuments, and externally divided into two equal parts by a prominent line called *raphe*.

In the inner part of the ſcrotum we meet with a cellular coat called *dartos* (N), which by its duplicature divides the ſcrotum into two equal parts, and forms what is called *ſeptum ſcroti*, which correſponds with the raphe. The collapſion which is ſo often obſerved to take place in the ſcrotum of the healthy ſubject, when excited by cold or by the ſtimulus of venery, ſeems to be very properly attributed to the contractile motion of the ſkin, and not to any muſcular fibres, as is the caſe in dogs and ſome other quadrupeds.

The ſcrotum, then, by means of its ſeptum, is found to make two diſtinct bags, in which the teſticles, inveſted by their proper tunics, are ſecurely lodged and ſeparated from each other. Theſe coats are the cremaſter, the tunica vaginalis, and the tunica albuginea. The firſt of theſe is compoſed of muſcular fibres, and is to be conſidered only as a partial covering of the teſtis; for it ſurrounds only the ſpermatic chord, and terminates upon the upper and external parts of the tunica vaginalis teſtis, ſerving to draw up and ſuſpend the teſticle (O). The tunica vaginalis teſtis has already been deſcribed as being a thin production of the peritonæum, looſely adhering every where to the teſticle, which it includes as it were in a bag. The tunica albuginea is a firm, white, and very compact membrane of a gliſtening appearance, which immediately inveſts the body of the teſtis and the epididymus; ſerving in ſome meaſure to connect them to each other, but without extending itſelf at all to the ſpermatic chord. This tunica albuginea ſerves to confine the growth of the teſtis and epididymus within certain limits, and by giving them a due degree of firmneſs, enables them to perform their proper functions.

Having removed this laſt tunic, we diſcover the ſubſtance of the teſticle itſelf, which appears to be made up of an infinite number of very elaſtic filaments, which may be beſt diſtinguiſhed after macerating the teſticle in water. Each teſticle is made up of the ſpermatic artery and vein, and the excretory veſſels or tubuli ſeminiferi. There are likewiſe a great number of abſorbent veſſels, and ſome branches of nerves to be met with in the teſticles.

The ſpermatic arteries ariſe one on each ſide from the aorta, generally about an inch below the emulgents. The right ſpermatic vein commonly paſſes into the vena cava; but the left ſpermatic vein uſually empties itſelf into the emulgent on that ſide; and it is ſup-

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jects it continues open during life; and when an hernia or deſcent of the inteſtine takes place in ſuch a ſubject, it does not puſh down a portion of the peritonæum before it, as it muſt otherwiſe neceſſarily do, but paſſes at once through this opening, and comes in contact with the naked teſticle, conſtituting that particular ſpecies of rupture called *hernia congenita*.

(N) The dartos has uſually been conſidered as a muſcle, and is deſcribed as ſuch both by Douglas and Winſlow. But there being no part of the ſcrotum of the human ſubject which can be ſaid to conſiſt of muſcular fibres, Albinus and Haller have very properly omitted to deſcribe the dartos as a muſcle, and conſider it merely as a cellular coat.

(O) The cremaſter muſcle is compoſed of a few fibres from the obliquus internus abdominis, which uniting with a few from the tranſverſalis, deſcend upon the ſpermatic chord, and are inſenſibly loſt upon the tunica vaginalis of the teſticle. It ſerves to ſuſpend and draw up the teſticle.

poſed to take this courſe into the emulgent, that it may avoid paſſing over the aorta, which it would be obliged to do in its way to the vena cava.

The blood is circulated very ſlowly through the ſpermatic artery, which makes an infinite number of circumvolutions in the ſubſtance of the teſticle, where it depoſites the ſemen, which paſſes through the tubuli ſeminiferi. Theſe tubuli ſeminiferi are ſeen running in ſhort waves from the tunica albuginea to the axis of the teſticle; and are divided into diſtinct portions by certain thin membranous productions, which originate from the tunica albuginea. They at length unite, and by an infinite number of convolutions form a ſort of appendix to the teſtis called *epididymis* (P), which is a vaſcular body of an oblong ſhape, ſituate upon the ſuperior part of each teſticle. Theſe tubuli of the epididymis at length form an excretory duct called *vas deferens*, which aſcends towards the abdominal rings, with the other parts that make up the ſpermatic chord, and then a ſeparation takes place; the nerves and blood-veſſels paſſing on to their ſeveral terminations, and the vas deferens going to depoſit its ſemen in the veſiculæ ſeminales, which are two ſoft bodies of a white and convoluted appearance externally, ſituated obliquely between the rectum and the lower part of the bladder, and uniting together at the lower extremity. From theſe reſervoirs (Q), which are plentifully ſupplied with blood-veſſels and nerves, the ſemen is occaſionally diſcharged through two ſhort paſſages, which open into the urethra cloſe to a little eminence called *verumontanum*.

Near this eminence we meet with the proſtate, which is ſituated at the neck of the bladder, and is deſcribed as being of a glandular ſtructure. It is ſhaped ſomewhat like a heart with its ſmall end foremoſt, and inveſts the origin of the urethra. Internally it appears to be of a firm ſubſtance, and compoſed of ſeveral follicles, ſecreting a whitiſh viſcid fluid, that is diſcharged by ten or twelve excretory ducts into the urethra, on each ſide of the openings of the veſiculæ ſeminales at the ſame time, and from the ſame cauſes that the ſemen is expelled. As this latter fluid is found to be exceedingly limpid in the veſiculæ ſeminales of the dead ſubject, it probably owes its whiteneſs and viſcidity to this liquor of the proſtate.

The penis, which is to be conſidered as the vehicle or active organ of procreation, is compoſed of two columns, the corpora cavernoſa, and corpus ſpongioſum. The corpora cavernoſa, which conſtitute the greateſt part of the penis, may be deſcribed as two cylindrical ligamentous tubes, each of which is compoſed of an infinite number of minute cells of a ſpongy texture, which communicate with each other. Theſe two bodies are of a very pliant texture, and capable of conſiderable diſtenſion; and being united laterally to each other, occaſion by this union a ſpace above and another below. The uppermoſt of theſe ſpaces is filled by the blood veſſels, and the lower one, which is larger than the other, by the urethra and its corpus ſpongioſum. Theſe two cavernous bodies are at firſt only ſeparated by a partition of tendinous fibres, which allow them to communicate with each other; but they afterwards devaricate from each other like the branches of the letter Y, and diminiſhing gradually in ſize, are attached,

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(P) The teſticles were named *didymi* by the ancients, and the name of this part was given to it on account of its ſituation upon the teſticle.

(Q) That the bags called *veſiculæ ſeminales* are reſervoirs of ſemen, is a circumſtance which has been by anatomiſts univerſally believed. Mr J. Hunter, however, from ſeveral circumſtances, has been induced to think this opinion erroneous.

He has examined theſe veſiculæ in people who have died ſuddenly, and he found their contents to be different in their properties from the ſemen. In thoſe who had loſt one of the teſticles, or the uſe of one of them, by diſeaſe, both the veſiculæ were full, and their contents ſimilar. And in a *luſus naturæ*, where there was no communication between the vaſa deferentia and veſiculæ, nor between the veſiculæ and penis, the ſame thing took place.

From theſe obſervations, he thinks we have a preſumptive proof, That the ſemen can be abſorbed in the body of the teſticle and in the epididymis, and that the veſiculæ ſecrete a mucus which they are capable of abſorbing when it cannot be made uſe of: That the ſemen is not retained in reſervoirs after it is ſecreted, and kept there till it is uſed; but that it is ſecreted at the time, in conſequence of certain affections of the mind ſtimulating the teſticles to this action.

He corroborates his obſervations by the appearance on diſſection in other animals; and here he finds, That the ſhape and contents of the veſiculæ vary much in different animals, while the ſemen in moſt of them he has examined is nearly the ſame: That the vaſa deferentia in many animals do not communicate with the veſiculæ: That the contents of the veſiculæ of caſtrated and perfect animals are ſimilar, and nearly equal in quantity, in no way reſembling the ſemen as emitted from the animal *in coitu*, or what is found in the vas deferens after death. He obſerves likewiſe, that the bulb of the urethra of perfect males is conſiderably larger than in caſtrated animals.

From the whole, he thinks the following inferences may be fairly drawn: That the bags called *veſiculæ ſeminales* are not ſeminal reſervoirs, but glands ſecreting a peculiar mucus; and that the bulb of the urethra is properly ſpeaking the receptacle of the ſemen, in which it is accumulated previous to ejection.

But although he has endeavoured to prove that the veſiculæ do not contain the ſemen, he has not been able to aſcertain their particular uſe. He thinks, however, we may be allowed upon the whole to conclude, that they are, together with other parts, ſubſervient to the purpoſes of generation.

Although the author has treated this ſubject very ably, and made many ingenious obſervations, ſome things may be objected to what he has advanced; of which the following are a few: That thoſe animals who have bags tached, one on each ſide, by means of the ligamentum ſuſpenſorium penis to the ramus iſchii, and to the inferior portion of the os pubis.

The corpus ſpongioſum penis, or corpus ſpongioſum urethræ, as it is ſtyled by ſome authors, begins as ſoon as the urethra has paſſed the proſtate, with a thick origin almoſt like a heart, firſt under the urethra, and afterwards above it, becoming gradually thinner, and ſurrounding the whole canal of the urethra, till it terminates in a conſiderable expanſion, and conſtitutes what is called the *glans penis*, which is exceedingly vaſcular, and covered with papillæ like the tongue. The cuticle which lines the inner ſurface of the urethra, is continued over the glans in the ſame manner as it is ſpread over the lips.

The penis is inveſted by the common integuments, but the cutis is reflected back every where from the glans as it is in the eye-lids; ſo that it covers this part, when the penis is in a relaxed ſtate, as it were with a hood, and from this uſe is called *prepuce*.

The prepuce is tied down to the under part of the glans by a ſmall ligament called *frænum*, which is in fact only a continuation of the cuticle and cutis. There are many ſimple ſebaceous follicles called *glandulæ odoriferæ*, placed round the baſis of the glans; and the fluid they ſecrete ſerves to preſerve the exquiſite ſenſibility of this part of the penis, and to prevent the ill effects of attrition from the prepuce.

The urethra may be defined to be a membranous canal, paſſing from the bladder through the whole extent of the penis. Several very ſmall openings, called *lacunæ*, communicate with this canal, through which a mucus is diſcharged into it; and beſides theſe, there are two glands, firſt deſcribed by Cowper, as ſecreting a fluid for lubricating the urethra, and called *Cowper's glands* (R); and Littre* ſpeaks of a gland ſituated near the proſtate, as being deſtined for the ſame uſe.

The urethra being continued from the neck of the bladder, is to be conſidered as making part of the urinary paſſage; and it likewiſe affords a conveyance to the ſemen, which we have obſerved is occaſionally diſcharged into it from the veſiculæ ſeminales. The direction of this canal being firſt under and then before the pubis, occaſions a winding in its courſe from the bladder to the penis not unlike the turns of the letter *S*.

The penis has three pair of muſcles, the erectores, acceleratores, and tranſverſales. They puſh the blood from the crura to the fore part of the corpora cavernoſa. The firſt originate from the tuberoſity of the iſchium, and terminate in the corpora cavernoſa. The acceleratores ariſe from the ſphincter, and by their inſertion ſerve to compreſs the bulbous part of the urethra; and the tranſverſales are deſtined to afford a paſſage to the ſemen, by dilating the canal of the urethra.

The arteries of the penis are chiefly derived from the internal iliacs. Some of them are ſuppoſed to terminate by pabulous orifices within the corpora cavernoſa and corpus ſpongioſum; and others terminate in veins, which at laſt make up the vena magna dorſi penis, and other ſmaller veins, which are in general diſtributed in like order with the arteries.

Its nerves are large and numerous. They ariſe from the great ſciatic nerve, and accompany the arteries in their courſe through the penis.

We have now deſcribed the anatomy of this organ; and there only remains to be explained, how it is enabled to attain that degree of firmneſs and diſtenſion which is eſſential to the great work of generation.

The greateſt part of the penis has been ſpoken of as being of a ſpongy and cellular texture, plentifully ſupplied with blood-veſſels and nerves, and as having muſcles to move it in different directions. Now, the blood is conſtantly paſſing into its cells through the ſmall branches of the arteries which open into them, and is from thence as conſtantly returned by the veins, ſo long as the corpora cavernoſa and corpus ſpongioſum continue to be in a relaxed and pliant ſtate. But when, from any nervous influence, or other means, which it is not neceſſary here to define or explain, the erectores penis, ejaculatores ſeminis, levatores ani, &c. are induced to contract, the veins undergo a certain degree of compreſſion, and the paſſage of the blood through them is ſo much impeded, that it collects in them in a greater proportion than they are enabled to carry off, ſo that the penis gradually enlarges; and being more and more forcibly drawn up againſt the os pubis, the vena magna itſelf is at length compreſſed, and the penis becomes fully diſtended. But as the cauſes which firſt occaſioned this diſtention ſubſide, the penis gradually returns to its ſtate of relaxation.

§ 2. *Female Organs of Generation.* 103

Anatomical writers uſually divide the female organs of generation into *external* and *internal*. In the firſt diviſion they include the *mons veneris, labia pudendi, perinæum, clitoris, nymphæ*, and *carunculæ myrtiformes*; and in the latter, the *vagina*, with the *uterus* and its appendages.

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* Memoires de l'Acad. Royale des Sciences, 1700.

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bags called *veſiculæ ſeminales* perform copulation quickly; whereas others that want them, as in the dog kind, are tedious in copulation: That in the human body, at leaſt, there is a free communication between the vaſa deferentia and veſiculæ; and in animals where the author has obſerved no communication between the vaſa deferentia and veſiculæ, there may be a communication by veſſels not yet diſcovered, and which may be compared to the hepato-cyſtic ducts in fowls and fiſhes: That the fluid in the end of the vaſa deferentia and the veſiculæ ſeminales are ſimilar, according to the author's own obſervation: That the veſiculæ in ſome animals increaſe and decreaſe with the teſticle at particular ſeaſons: That in birds and certain fiſhes, there is a dilatation of the ends of the vaſa deferentia, which the author himſelf allows to be a reſervoir for the ſemen.

With reſpect to the circumſtance of the bulb of the urethra anſwering the purpoſe of a reſervoir, the author has mentioned no facts which tend to eſtabliſh this opinion. See *Obſervations on certain Parts of the Animal Oeconomy*.

(R) Both Heiſter and Morgagni obſerve, that they have ſometimes not been able to find theſe glands; ſo that they do not ſeem to exiſt in all ſubjects.

The *mons veneris*, which is placed on the upper part of the ſymphyſis pubis, is internally compoſed of adipoſe menbranes, which makes it ſoft and prominent: it divides into two parts called *labia pudendi*, which deſcending towards the rectum, from which they are divided by the perinæum, form what is called the *fourchette*. The perinæum is that fleſhy ſpace which extends about an inch and an half from the fourchette to the anus, and from thence about two inches to the coccyx.

The labia pudendi being ſeparated, we obſerve a ſulcus called *foſſa magna*; in the upper part of which is placed the clitoris, a ſmall round ſpongy body, in ſome meaſure reſembling the male penis, but impervious, compoſed of two corpora cavernoſa, ariſing from the tuberoſities of the oſſa iſchii; furniſhed with two pair of muſcles, the erectores clitoridis, and the ſphincter or conſtrictor oſtii vaginæ; and terminating in a glans, which is covered with its prepuce. From the lower part, on each ſide of the foſſa, paſs the nymphæ, two membranous and ſpongy folds which ſeem deſtined for uſeful purpoſes in parturition, by tending to enlarge the volume of the vagina as the child's head paſſes through it. Between theſe, about the middle of the foſſa magna, we perceive the orifice of the vagina or os externum, cloſed by folds and wrinkles; and about half an inch above this, and about an inch below the clitoris, appears the meatus urinarius or orifice of the urethra, much ſhorter, though ſomewhat larger, than in men, with a little prominence at its lower edge, which facilitates the introduction of the catheter.

The os externum is ſurrounded internally by ſeveral membranous folds called *carunculæ myrtiformes*, which are partly the remains of a thin membrane called *hymen*, that covers the vagina in children. In general the hymen is ſufficiently open to admit the paſſage of the menſes, if it exiſts at the time of their appearance; ſometimes, however, it has been found perfectly cloſed.

The vagina, ſituated between the urethra and the rectum, is a membranous cavity, ſurrounded eſpecially at its external extremity with a ſpongy and vaſcular ſubſtance, which is covered by the ſphincter oſtii vaginæ. It terminates in the uterus, about half an inch above the os tincæ, and is wider and ſhorter in women who have had children than in virgins.

All theſe parts are plentifully ſupplied with blood-veſſels and nerves. Around the nymphæ there are ſebaceous follicles, which pour out a fluid to lubricate the inner ſurface of the vagina; and the meatus urinarius, like the urethra in the male ſubject, is conſtantly moiſtened by a mucus, which defends it againſt the acrimony of the urine.

The *uterus* is a hollow viſcus, ſituated in the hypogaſtric region, between the rectum and bladder. It is deſtined to receive the firſt rudiments of the fœtus, and to aſſiſt in the developement of all its parts, till it arrives at a ſtate of perfection, and is fitted to enter into the world, at the time appointed by the wiſe Author of nature.

The uterus, in its unimpregnated ſtate, reſembles a pear in ſhape, ſomewhat flattened, with its fundus or bottom part turned towards the abdomen, and its cervix or neck ſurrounded by the vagina. The entrance into its cavity forms a little protuberance, which has been compared to the mouth of a tench, and is therefore called *os tincæ*.

The ſubſtance of the uterus, which is of a conſiderable thickneſs, appears to be compoſed of muſcular and ſmall ligamentous fibres, ſmall branches of nerves, ſome lymphatics, and with arteries and veins innumerable. Its nerves are chiefly derived from the intercoſtal, and its arteries and veins from the hypogaſtric and ſpermatic. The membrane which lines its cervix, is a continuation of the inner membrane of the vagina; but the outer ſurface of the body of the uterus is covered with the peritonæum, which is reflected over it, and deſcends from thence to the inteſtinum rectum. This duplicature of the peritonæum, by paſſing off from the ſides of the uterus to the ſides of the pelvis, is there firmly connected, and forms what are called *ligamenta uteri lata*; which not only ſerve to ſupport the uterus, but to convey nerves and blood-veſſels to it.

The *ligamenta uteri rotunda* ariſe from the ſides of the fundus uteri, and paſſing along within the fore-part of the ligamenta lata, deſcend through the abdominal rings, and terminate in the ſubſtance of the mons veneris. The ſubſtance of theſe ligaments is vaſcular, and although both they and the ligamenta lata admit the uterus in the virgin ſtate, to move only about an inch up and down, yet in the courſe of pregnancy they admit of conſiderable diſtenſion, and after parturition return nearly to their original ſtate with ſurpriſing quickneſs.

On each ſide of the inner ſurface of the uterus, in the angle near the fundus, a ſmall orifice is to be diſcovered, which is the beginning of one of the tubæ fallopianæ. Each of theſe tubes, which are two in number, paſſing through the ſubſtance of the uterus, is extended along the broad ligaments, till it reaches the edge of the pelvis, from whence it reflects back; and turning over behind the ligaments, about an inch of its extremity is ſeen hanging looſe in the pelvis, near the ovarium. Theſe extremities, having a jagged appearance, are called *fimbriæ*, or *morſus diaboli*. Each tuba Fallopiana is uſually about three or four inches long. Their cavities are at firſt very ſmall, but become gradually larger, like a trumpet, as they approach the fimbriæ.

Near the fimbriæ of each tuba Fallopiana, about an inch from the uterus, is ſituated an oval body called *ovarium*, of about half the ſize of the male teſticle. Each of theſe ovaria is covered by a production of the peritonæum, and hangs looſe in the pelvis. They are of a flat and angular form, and appear to be compoſed of a white and cellular ſubſtance, in which we are able to diſcover ſeveral minute veſicles filled with a coagulable lymph, of an uncertain number, commonly exceeding 12 in each ovary. In the female of riper years, theſe veſicles become exceedingly turgid, and a kind of yellow coagulum is gradually formed within one of them, which increaſes for a certain time. In conception, one of theſe mature ova is ſuppoſed to be impregnated with the male ſemen, and to be ſqueezed out of its nidus into the Fallopian tube; after which the ruptured part forms a ſubſtance which in ſome animals is of a yellow colour, and is therefore called *corpus luteum*; and it is obſervable, that the number of theſe ſcars or fiſſures in the ovarium, conſtantly correſponds with the number of fœtuſes excluded by the mother.

§ 3. *Of Conception.*

109 MAN, being ever curious and inquiſitive, has naturally been led to enquire after the origin of his exiſtence; and the ſubject of generation has employed the philoſophical world in all ages: but in following nature up to her minute receſſes, the philoſopher ſoon finds himſelf bewildered, and his imagination often ſupplies that which he ſo eagerly wiſhes to diſcover, but which is deſtined perhaps never to be revealed to him. Of the many theories which have been formed on this ſubject, that of the ancient philoſophers ſeems to have been the moſt ſimple: they conſidered the male ſemen as alone capable of forming the fœtus, and believed that the female only afforded it a lodging in the womb, and ſupplied it with nouriſhment after it was perfectly formed. This opinion, however, ſoon gave place to another, in which the female was allowed a more conſiderable ſhare in conception.

This ſecond ſyſtem conſidered the fœtus as being formed by the mixture of the ſeminal liquor of both ſexes, by a certain arrangement of its ſeveral particles in the uterus. But in the 16th century, veſicles or eggs were diſcovered in the ovaria or female teſticles; the fœtus had been found ſometimes in the abdomen, and ſometimes in the Fallopian tubes; and the two former opinions were exploded in favour of a new doctrine. The ovaria were compared to a bunch of grapes, being ſuppoſed to conſiſt of veſicles, each of which had a ſtalk; ſo that it might be diſengaged without hurting the reſt, or ſpilling the liquor it contained. Each veſicle was ſaid to include a little animal, almoſt complete in all its parts; and the vapour of the male ſemen being conveyed to the ovarium, was ſuppoſed to produce a fermentation in the veſicle, which approached the neareſt to maturity; and thus inducing it to diſengage itſelf from the ovarium, it paſſed into the tuba Fallopiana, thro' which it was conveyed to the uterus. Here it was ſuppoſed to take root like a vegetable ſeed, and to form, with the veſſels originating from the uterus, what is called the *placenta*; by means of which the circulation is carried on between the mother and the fœtus.

This opinion, with all its abſurdities, continued to be almoſt univerſally adopted till the cloſe of the ſame century, when Lieuwenhoeck, by means of his glaſſes, diſcovered certain opake particles, which he deſcribed as ſo many animalcula, floating in the ſeminal fluid of the male.

This diſcovery introduced a new ſchiſm among the philoſophers of that time, and gave riſe to a ſyſtem which is not yet entirely exploded. According to this theory the male ſemen paſſing into the tubæ Fallopianæ, one of the animalcula penetrates into the ſubſtance of the ovarium, and enters into one of its veſicles or ova. This impregnated ovum is then ſqueezed from its huſk, through the coats of the ovarium, and being ſeized by the fimbriæ, is conducted through the tube to the uterus, where it is nouriſhed till it arrives at a ſtate of perfection. In this ſyſtem there is much ingenuity: but there are certain circumſtances ſuppoſed to take place, which have been hitherto inexplicable. A celebrated modern writer, M. Buffon, endeavours to reſtore, in ſome meaſure, the moſt ancient opinion, by allowing the female ſemen a ſhare in this office; aſſerting, that animalcula or organic particles are to be diſcovered in the ſeminal liquor of both ſexes: he derives the female ſemen from the ovaria, and he contends that no ovum exiſts in thoſe parts. But in this idea he is evidently miſtaken; and the opinion now moſt generally adopted is, that an impregnation of the ovum, by the influence of the male ſemen, is eſſential to conception (s). That the ovum is to be impregnated, there can be no doubt; but as the manner in which ſuch an impregnation is ſuppoſed to take place, and the means by which the ovum afterwards gets into the Fallopian tube, and from thence into the uterus, are ſtill founded chiefly on hypotheſis, we will not attempt to extend farther the inveſtigation of a ſubject concerning which ſo little can be advanced with certainty.

§ 4. *Of the Fœtus in Utero.*

OPPORTUNITIES of diſſecting the human gravid uterus occurring but ſeldom, the ſtate of the embryo (T) immediately after conception cannot be perfectly known. 110

When the ovum deſcends into the uterus, it is ſuppoſed to be very minute; and it is not till a conſiderable time after conception that the rudiments of the embryo begin to be aſcertained.

About the third or fourth week the eye may diſcover the firſt lineaments of the fœtus; but theſe lineaments are as yet very imperfect, it being only about the ſize of a houſe-fly. Two little veſſels appear in an almoſt tranſparent jelly; the largeſt of which is deſtined to become the head of the fœtus, and the other ſmaller one is reſerved for the trunk. But at this period no extremities are to be ſeen; the umbilical cord appears only as a very minute thread, and the placenta does not as yet abſorb the red particles of the blood. At ſix weeks, not only the head but the features of the face begin to be developed. The noſe appears like a ſmall prominent line, and we are able to diſcover another line under it, which is deſtined for the ſeparation of the lips. Two black points appear in the place of eyes, and two minute holes mark the ears. At the ſides of the trunk, both above and below, we ſee four minute protuberances, which are the rudiments of the arms and legs. At the end of eight weeks the body of the fœtus is upwards of an inch in length, and both the hands and feet are to be diſtinguiſhed. The upper extremities are found to increaſe faſter than the lower ones, and the ſeparation of the fingers is accompliſhed ſooner than that of the toes.

At this period the human form may be deciſively aſcertained;—all the parts of the face may be diſtinguiſhed, the ſhape of the body is clearly marked out, the haunches and the abdomen are elevated, the fingers and toes are ſeparated from each other, and the inteſtines appear like minute threads.

(s) The learned Abbè Spallanzani has thrown much light on this curious ſubject, and has proved by a variety of experiments that the animalcule exiſts entire in the female ovum and that the male ſeed is only neceſſary to vivify and put it in motion.—His experiments and obſervations are worthy the attentive peruſal of every phyſiologiſt.

(T) The rudiments of the child are uſually diſtinguiſhed by this name till the human figure can be diſtinctly aſcertained, and then it has the appellation of *fœtus*.

At the end of the third month, the fœtus meaſures about three inches; at the end of the fourth month, five inches; in the fifth month, ſix or ſeven inches; in the ſixth month, eight or nine inches; in the ſeventh month, eleven or twelve inches; in the eighth month, fourteen or fifteen inches; and at the end of the ninth month, or full time, from eighteen to twenty-two inches. But as we have not an opportunity of examining the ſame fœtus at different periods of pregnancy, and as their ſize and length may be influenced by the conſtitution and mode of life of the mother, calculations of this kind muſt be very uncertain.

The fœtus during all this time aſſumes an oval figure, which correſponds with the ſhape of the uterus. Its chin is found reclining on its breaſt with its knees drawn up towards its chin, and its arms folded over them. But it ſeems likely, that the poſture of ſome of theſe parts is varied in the latter months of pregnancy, ſo as to cauſe thoſe painful twitches which its mother uſually feels from time to time. In natural caſes, its head is probably placed towards the os tincæ from the time of conception to that of its birth; though formerly it was conſidered as being placed towards the fundis uteri till about the eighth or ninth month, when the head, by becoming ſpecifically heavier than the other parts of the body, was ſuppoſed to be turned downwards.

The capacity of the uterus increaſes in proportion to the growth of the fœtus, but without becoming thinner in its ſubſtance, as might naturally be expected. The nouriſhment of the fœtus, during all this time, ſeems to be derived from the placenta, which appears to be originally formed by that part of the ovum which is next the fundus uteri. The remaining part of the ovum is covered by a membrane called *ſpongy chorion* (u); within which is another called *true chorion*, which includes a third termed *amnios* (v): this contains a watery fluid, which is the *liquor amnii* (w), in which the fœtus floats till the time of its birth. On the ſide next the fœtus, the placenta is covered by the amnios and true chorion; on the ſide next the mother it has a production continued from the ſpongy chorion. The amnios and chorion are remarkably thin and tranſparent, having no blood-veſſels entering into their compoſition. The ſpongy chorion is opake and vaſcular.

In the firſt months of pregnancy, the involucra bear a large proportion to their contents; but this proportion is afterwards reverſed, as the fœtus increaſes in bulk.

The placenta, which is the medium through which the blood is conveyed from the mother to the fœtus, and the manner in which this conveyance takes place, deſerve next to be conſidered.

The placenta is a broad, flat, and ſpongy ſubſtance, like a cake, cloſely adhering to the inner ſurface of the womb, uſually near the fundus, and appearing to be chiefly made up of the ramifications of the umbilical arteries and vein, and partly of the extremities of the uterine veſſels. The arteries of the uterus diſcharge their contents into the ſubſtance of this cake; and the veins of the placenta, receiving the blood either by a direct communication of veſſels, or by abſorption, at length form the umbilical vein, which paſſes on to the ſinus of the vena porta, and from thence to the vena cava, by means of the canalis venoſus, a communication that is cloſed in the adult. But the circulation of the blood through the heart is not conducted in the fœtus as in the adult: in the latter, the blood is carried from the right auricle of the heart through the pulmonary artery, and is returned to the left auricle by the pulmonary vein; but a dilatation of the lungs is eſſential to the paſſage of the blood through the pulmonary veſſels, and this dilatation cannot take place till after the child is born and has reſpired. This deficiency, however, is ſupplied in the fœtus by the immediate communication between the right and left auricle, through an oval opening, in the ſeptum which divides the two auricles, called *foramen ovale*. The blood is likewiſe tranſmitted from the pulmonary artery to the aorta, by means of a duct called *canalis arterioſus*, which, like the canalis venoſus, and foramen ovalæ, gradually cloſes after birth.

The blood is returned again from the fœtus through two arteries called the *umbilical arteries*, which ariſe from the iliacs. Theſe two veſſels taking a winding courſe with the vein, form with that, and the membranes by which they are ſurrounded, what is called the *umbilical chord*. Theſe arteries, after ramifying through the ſubſtance of the placenta, diſcharge their blood into the veins of the uterus; in the ſame manner as the uterine arteries diſcharged their blood into the branches of the umbilical vein. So that the blood is conſtantly paſſing in at one ſide of the placenta and out at the other; but in what particular manner it gets through the placenta is a point not yet determined.

(u) Dr Hunter has deſcribed this as a lamella from the inner ſurface of the uterus. In the latter months of pregnancy it becomes gradually thinner and more connected with the chorion: he has named it *membrana caduca*, or *decidua*, as it is caſt off with the placenta. Signior Scarpa, with more probability, conſiders it as being compoſed of an inſpiſſated coagulable lymph.

(v) In ſome quadrupeds, the urine appears to be conveyed from the bladder through a canal called *urachus*, to the *allantois*, which is a reſervoir, reſembling a long and blind gut, ſituated between the chorion and amnios. The human fœtus ſeems to have no ſuch reſervoir, though ſome writers have ſuppoſed that it does exiſt. From the top of the bladder a few longitudinal fibres are extended to the umbilical chord; and theſe fibres have been conſidered as the urachus, though without having been ever found pervious.

(w) The liquor amnii coagulates like the lymph. It has been ſuppoſed to paſs into the œſophagus, and to afford nouriſhment to the fœtus; but this does not ſeem probable. Children have come into the world without an œſophagus, or any communication between the ſtomach and the mouth; but there has been no well atteſted inſtance of a child's having been born without a placenta; and it does not ſeem likely, that any of the fluid can be abſorbed through the pores of the ſkin, the ſkin in the fœtus being every where covered with a great quantity of mucus.

EXPLANATION OF PLATES XXV. XXVI. AND XXVII.

PLATE XXV.

FIG. 1. Shows the Contents of the Thorax and Abdomen in ſitu.

1. Top of the trachea, or wind-pipe. 2 2, The internal jugular veins. 3 3, The ſubclavian veins. 4, The vena cava deſcendens. 5, The right auricle of the heart. 6, The right ventricle. 7, Part of the left ventricle. 8, The aorta deſcendens. 9, The pulmonary artery. 10, The right lung, part of which is cut off to ſhow the great blood veſſels. 11, The left lung entire. 12 12, The anterior edge of the diaphragm. 13 13, The two great lobes of the liver. 14, The ligamentum rotundum. 15, The gall-bladder. 16 The ſtomach. 17 17, The jejunum and ilium. 18, The ſpleen.

FIG. 2. Shows the Organs ſubſervient to the Chylopoietic Viſcera,—with thoſe of Urine and Generation.

1 1, The under ſide of the two great lobes of the liver. a, Lobulus Spigelii. 2, The ligamentum rotundum. 3, The gall-bladder. 4. The pancreas. 5, The ſpleen. 6 6, The kidneys. 7, The aorta deſcendens. 8, Vena cava aſcendens. 9 9, The renal veins covering the arteries. 10, A probe under the ſpermatic veſſels and a bit of the inferior meſenteric artery, and over the ureters. 11 11, The ureters. 12 12, The iliac arteries and veins. 13, The rectum inteſtinum. 14, The bladder of urine.

FIG. 3. Shows the Chylopoietic Viſcera, and Organs ſubſervient to them, taken out of the Body entire.

A A, The under ſide of the two great lobes of the liver. B, Ligamentum rotundum. C, The gall-bladder. D, Ductus cyſticus. E, Ductus hepaticus. F, Ductus communis choledochus. G, Vena portarum. H, Arteria hepatica. I I, The ſtomach. K K, Venæ & arteriæ gaſtro-epiploicæ, dextræ & ſiniſtræ. L L, Venæ & arteriæ coronariæ ventriculi. M, The ſpleen. N N, Meſocolon, with its veſſels. O O O, Inteſtinum colon. P, One of the ligaments of the colon, which is a bundle of longitudinal muſcular fibres. Q Q Q Q, Jejunum and ilium. R R, Sigmoid flexure of the colon with the ligament continued, and over S, The rectum inteſtinum. T T, Levatores ani. U, Sphincter ani. V, The place to which the proſtate gland is connected. W, The anus.

FIG. 4. Shows the Heart of a Fœtus at the full time, with the Right Auricle cut open to ſhow the Foramen Ovale, or paſſage between both Auricles.

a, The right ventricle. b, The left ventricle. c c, The outer ſide of the right auricle ſtretched out. d d, The poſterior ſide, which forms the anterior ſide of the ſeptum. e, The foramen ovale, with the membrane or valve which covers the left ſide. f, Vena cava inferior paſſing through g, A portion of the diaphragm.

FIG. 5. Shows the Heart and Large Veſſels of a Fœtus at the full time.

a, The left ventricle. b, The right ventricle. c, A part of the right auricle. d, Left auricle. e e, The right branch of the pulmonary artery. f, Arteria pulmonalis. g g, The left branch of the pulmonary artery, with a number of its largeſt branches diſſected from the lungs. h, The canalis arterioſus. i, The arch of the aorta. k k, The aorta deſcendens. l, The left ſubclavian artery. m, The left carotid artery. n, The right carotid artery. o, The right ſubclavian artery. p, The origin of the right carotid and right ſubclavian arteries in one common trunk. q, The vena cava ſuperior or deſcendens. r, The right common ſubclavian vein. s, The left common ſubclavian vein.

N. B. All the parts deſcribed in this figure are to be found in the adult, except the canalis arterioſus.

PLATE XXVI.

FIG. 1. Exhibits the more ſuperficial Lymphatic Veſſels of the Lower Extremity.

A, The ſpine of the os ilium. B, The os pubis. C, The iliac artery. D, The knee. E, E, F, Branches of the crural artery. G, The muſculus gaſtrocnemius. H, The tibia. I, The tendon of the muſculus tibialis anticus. On the out-lines, a, A lymphatic veſſel belonging to the top of the foot. b, Its firſt diviſion into branches. c, c, c, Other diviſions of the ſame lymphatic veſſel. d, A ſmall lymphatic gland. e, The lymphatic veſſels which lie between the ſkin and the muſcles of the thigh. f, f, Two lymphatic glands at the upper part of the thigh below the groin. g, g, Other glands. h, A lymphatic veſſel which paſſes by the ſide of thoſe glands without communicating with them; and, bending towards the inſide of the groin at (i), opens into the lymphatic gland (k). l, l, Lymphatic glands in the groin, which are common to the lymphatic veſſels of the genitals and thoſe of the lower extremity. m, n, A plexus of lymphatic veſſels paſſing on the inſide of the iliac artery.

FIG. 2. Exhibits a Back View of the Lower Extremity, diſſected ſo as to ſhow the deeper-ſeated Lymphatic Veſſels which accompany the Arteries.

A, The os pubis. B, The tuberoſity of the iſchium. C, That part of the os ilium which was articulated with the os ſacrum. D, The extremity of the iliac artery appearing above the groin. E, The knee. F F, The two cut ſurfaces of the triceps muſcle, which was divided to ſhow the lymphatic veſſels that paſs through its perforation along with the crural artery. G, The edge of the muſculus gracilis. H, The gaſtrocnemius and ſoleus, much ſhrunk by being dried, and by the ſoleus being ſeparated from the tibia to expoſe the veſſels. I, The heel. K, The ſole of the foot. L, The ſuperficial lymphatic veſſels paſſing over the knee, to get to the thigh. On the out-lines; M, The poſterior tibial artery. a, A lymphatic veſſel accompanying the poſterior tibial artery. b, The ſame veſſel croſſing the artery. c, A ſmall lymphatic gland, thro' which this deep-ſeated lymphatic veſſel paſſes. d, The lymphatic veſſel paſſing under a ſmall part of the ſoleus, which is left attached to the bone, the reſt being removed. e, The lymphatic veſſel croſſing the popliteal artery. f, g, h, Lymphatic glands in the ham, through which the lymphatic veſſel paſſes. i, The lymphatic veſſel paſſing with the crural artery, through the perforation of the triceps muſcle. k, The lymphatic veſſel, after it has paſſed the perforation of the triceps, dividing into branches which embrace the artery (l). m, A lymphatic gland belonging to the deep-ſeated lymphatic veſſel. At this place thoſe veſſels paſs to the fore part of the groin, where they communicate with the ſuperficial lymphatic veſſels. n, A part of the ſuperficial lymphatic veſſel appearing on the brim of the pelvis.

Fig. 3. Exhibits the Trunk of the Human Subject, prepared to ſhow the Lymphatic Veſſels and the Ductus Thoracicus.

A, The neck. B B, The two jugular veins. C, The vena cava ſuperior. D D D D, The ſubclavian veins. E, The beginning of the aorta, pulled to the left ſide by means of a ligature, in order to ſhow the thoracic duct behind it. F, The branches ariſing from the curvature of the aorta. G G, The two carotid arteries. H H, The firſt ribs, II, The trachea. K K, The ſpine. L L, the vena azygos. M M, The deſcending aorta. N, The cœliac artery, dividing into three branches. O, The ſuperior meſenteric artery. P, The right crus diaphragmatis. Q Q, The two kidneys. R, The right emulgent artery. S S, The external iliac arteries. g d, The muſculi pſoæ. T, The internal iliac artery. U, The cavity of the pelvis. X X, The ſpine of the os ilium. Y Y, The groins. *a*, A lymphatic gland in the groin, into which lymphatic veſſels from the lower extremity are ſeen to enter. *b b*, The lymphatic veſſels of the lower extremities paſſing under Poupart's ligament. *c c*, A plexus of the lymphatic veſſels lying on each ſide of the pelvis. *d*, The pſoas muſcle with lymphatic veſſels lying upon its inſide. *e*, A plexus of lymphatics, which having paſſed over the brim of the pelvis at (*c*), having entered the cavity of the pelvis, and received the lymphatic veſſels belonging to the viſcera contained in that cavity, next aſcends, and paſſes behind the iliac artery to (*g*). *f*, Some lymphatic veſſels of the left ſide paſſing over the upper part of the os ſacrum, to meet thoſe of the right ſide. *g*, The right pſoas, with a large plexus of lymphatics lying on its inſide. *h h*, The plexus lying on each ſide of the ſpine. *i i i*, Spaces occupied by the lymphatic glands. *k*, The trunk of the lacteals, lying on the under ſide of the ſuperior meſenteric artery. *l*, The ſame dividing into two branches, one of which paſſes on each ſide of the aorta; that of the right ſide being ſeen to enter the thoracic duct at (*m*). *m*, The thoracic duct beginning from the large lymphatics. *n*, The duct paſſing under the lower part of the crus diaphragmatis, and under the right emulgent artery. *o*, The thoracic duct penetrating the thorax. *p*, Some lymphatic veſſels joining that duct in the thorax. *q*, The thoracic duct paſſing under the curvature of the aorta to get to the left ſubclavian vein. The aorta being drawn aſide to ſhow the duct. *r*, A plexus of lymphatic veſſels paſſing upon the trachea from the thyroid gland to the thoracic duct.

PLATE XXVII.

Fig. 1. Repreſents the Under and Poſterior Side of the Bladder of Urine, &c.

a, The bladder. b b, The inſertion of the ureters. c c, The vaſa deferentia, which convey the ſemen from the teſticles to d d, The veſiculæ ſeminales,—and paſs through e, The proſtate gland, to diſcharge themſelves into f, The beginning of the urethra.

Fig. 2. A tranſverſe Section of the Penis.

g g, Corpora cavernoſa penis. h, Corpus cavernoſum urethræ. i, Urethra. k, Septum penis. l l, The ſeptum between the corpus cavernoſum urethræ and that of the penis.

Fig. 3. A Longitudinal Section of the Penis.

m m, The corpora cavernoſa penis, divided by o, The ſeptum penis. n, The corpus cavernoſum glandis, which is the continuation of that of the urethra.

Fig. 4. Repreſents the Female Organs of Generation.

a, That ſide of the uterus which is next the os ſacrum. 1, Its fundus. 2, Its cervix. b b, The Fallopian or uterine tubes, which open into the cavity of the uterus;—but the other end is open within the pelvis, and ſurrounded by c c, The fimbriæ. d d, The ovaria. e, The os internum uteri, or mouth of the womb. f f, The ligamenta rotunda, which paſſes without the belly, and is fixed to the labia pudendi. g g, The cut edges of the ligamenta lata, which connects the uterus to the pelvis. h, The inſide of the vagina. i, The orifice of the urethra. k, The clitoris ſurrounded by (l,) The præputium. m m, The labia pudendi. n n, The nymphæ.

Fig. 5. Shows the Spermatic Ducts of the Teſticle filled with Mercury.

A, The vas deferens. B, Its beginning, which forms the poſterior part of the epididymis. B, The middle of the epididymis, compoſed of ſerpentine ducts. D, The head or anterior part of the epididymis unravelled. e e e e, The whole ducts which compoſe the head of the epididymis unravelled. f f, The vaſa deferentia. g g, Rete teſtis. h h, Some rectilineal ducts which ſend off the vaſa deferentia. i i, The ſubſtance of the teſticle.

Fig. 6. The right Teſticle entire, and the Epididymis filled with Mercury.

A, The beginning of the vas deferens. B, The vas deferens aſcending towards the abdomen. C, The poſterior part of the epididymis, named *globus minor*. D, The ſpermatic veſſels incloſed in cellular ſubſtance. E, The body of the epididymis. F, Its head, named *globus major*. G, Its beginning from the teſticle. H, The body of the teſticle, incloſed in the tunica albuginea.

Fig 1.

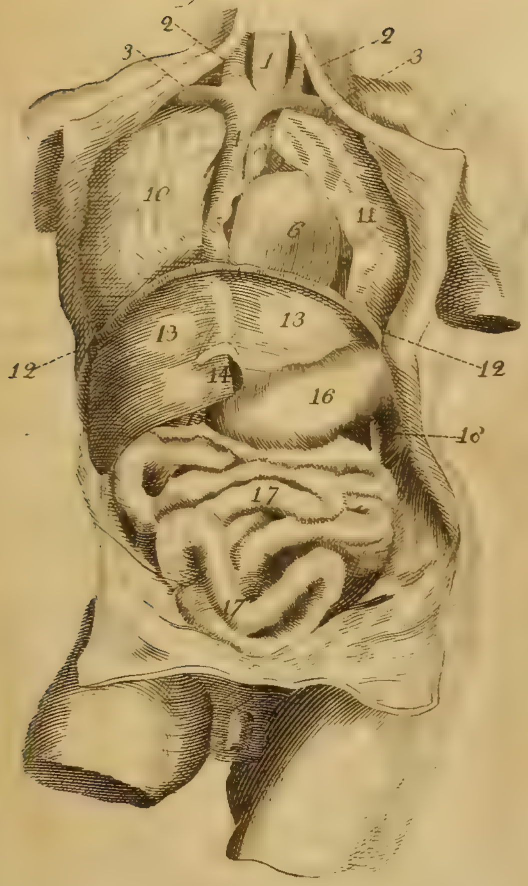
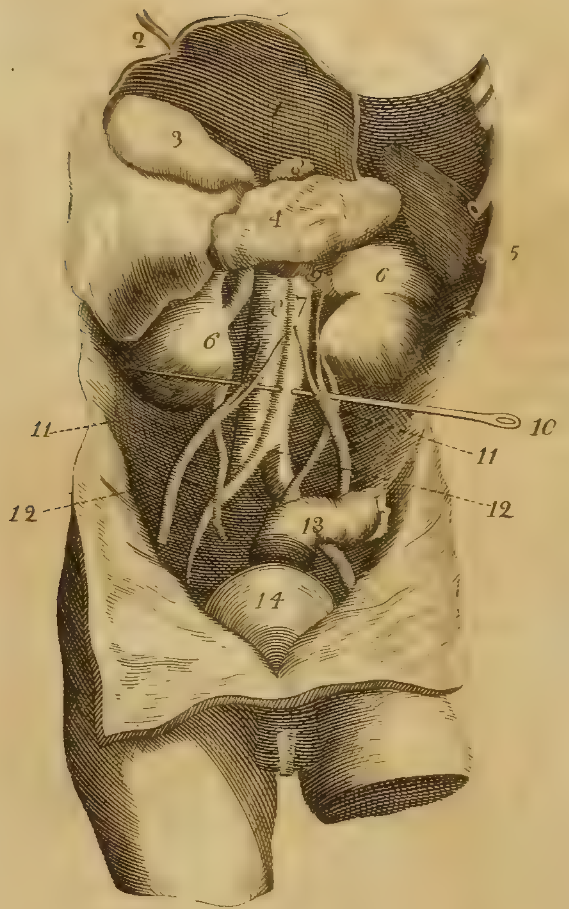


Fig. 2.



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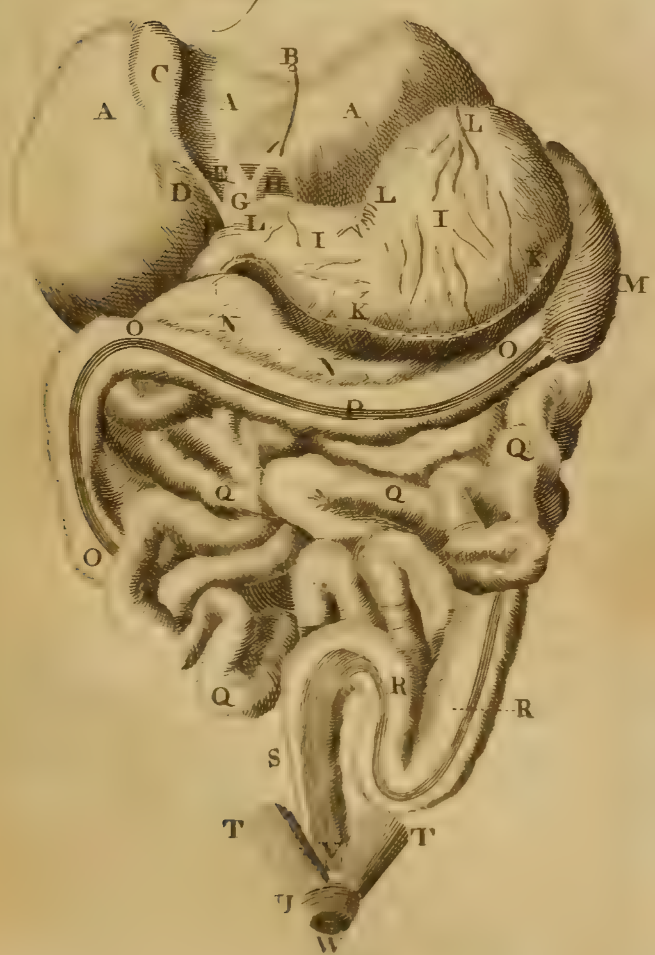

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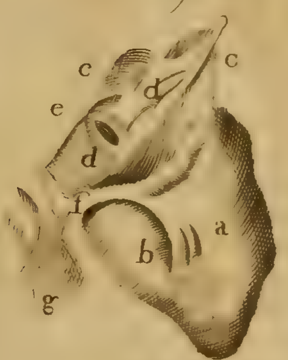

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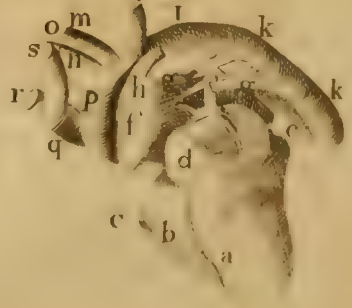


Scot. Philada

ANATOMY

Plate XXVI

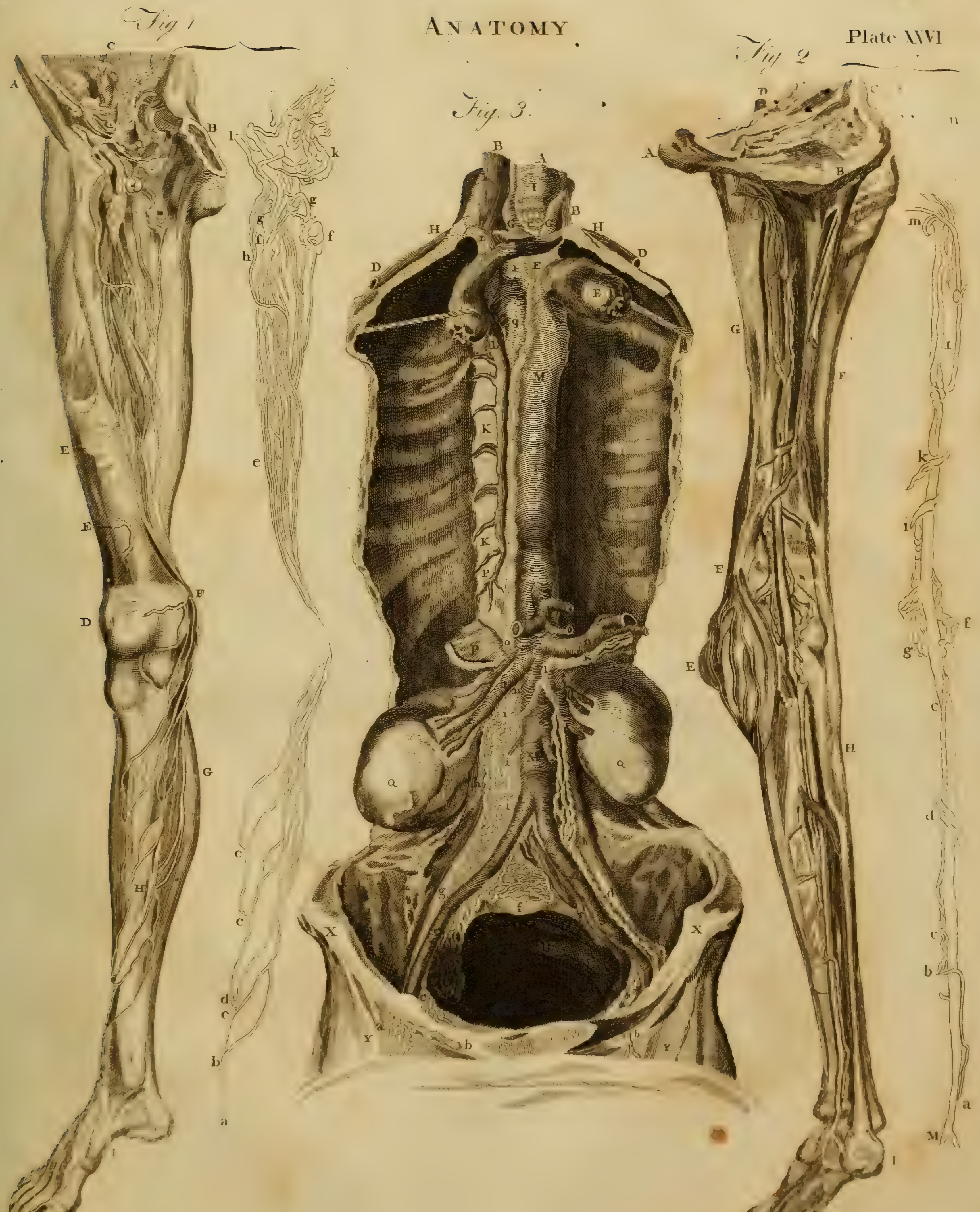


Fig 1

Fig. 3

Fig 2

ANATOMY

Fig. 1

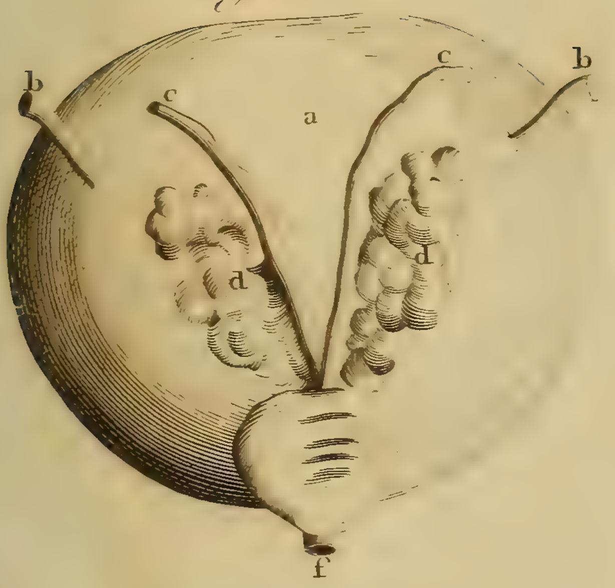


Fig. 2

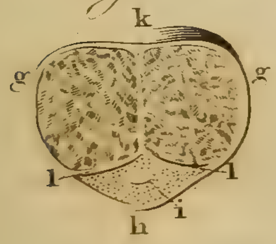


Fig. 3

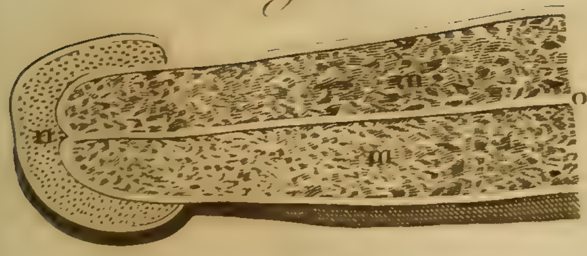


Fig. 4

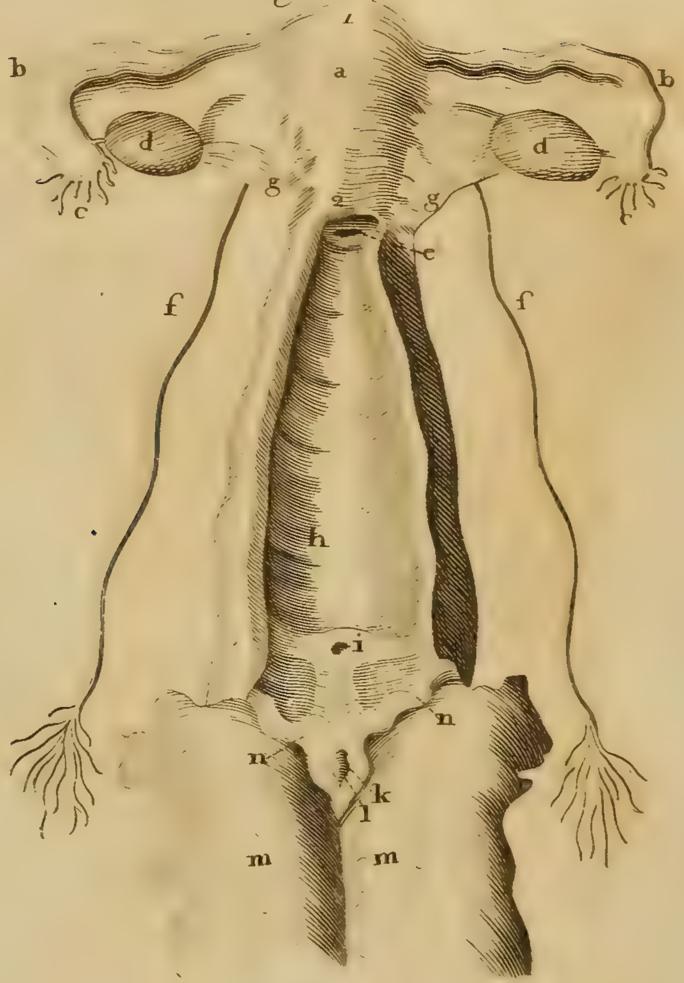


Fig. 5

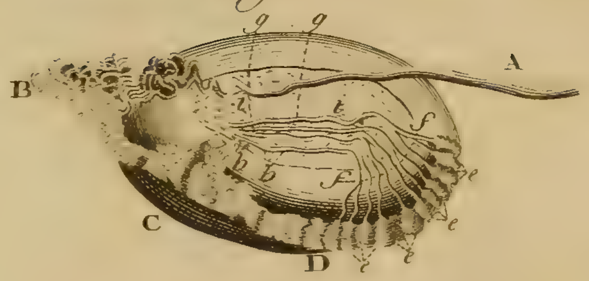
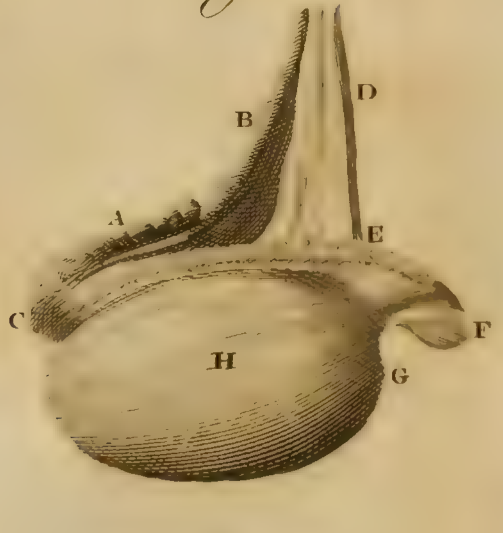


Fig. 6



Scot. Philad^{a}

PART IV. OF THE THORAX.

111 Of the cheſt. THE THORAX, or CHEST, is that cavity of the trunk which extends from the clavicles, or the lower part of the neck, to the diaphragm, and includes the vital organs, which are the heart and lungs; and likewiſe the trachea and œſophagus.—This cavity is formed by the ribs and vertebræ of the back, covered by a great number of muſcles, and by the common integuments, and anteriorly by two glandular bodies called the *breaſts*. The ſpaces between the ribs are filled up by muſcular fibres, which from their ſituation are called *intercoſtal muſcles*.

SECT. I. *Of the Breaſts.*

112. THE *breaſts* may be defined to be two large conglomerate glands, mixed with a good deal of adipoſe membrane. The glandular part is compoſed of an infinite number of minute arteries, veins, and nerves.

The arteries are derived from two different trunks; one of which is called the *internal*, and the other the *external*, *mammary artery*. The firſt of theſe ariſes from the ſubclavian, and the latter from the axillary.

The veins every where accompany the arteries, and are diſtinguiſhed by the ſame name. The nerves are chiefly from the vertebral pairs. Like all other conglomerate glands, the breaſts are made up of a great many ſmall diſtinct glands, in which the milk is ſecreted from the ultimate branches of arteries. The excretory ducts of theſe ſeveral glands gradually uniting as they approach the nipple, form the tubuli lactiferi, which are uſually more than a dozen in number, and open at its apex, but have little or no communication, as has been ſuppoſed, at the root of the nipple. Theſe ducts, in their courſe from the glands, are ſurrounded by a ligamentary elaſtic ſubſtance, which terminates with them in the nipple. Both this ſubſtance, and the ducts which it contains, are capable of conſiderable extenſion and contraction; but in their natural ſtate are moderately corrugated, ſo as to prevent an involuntary flow of milk, unleſs the diſtending force be very great from the accumulation of too great a quantity.

The whole ſubſtance of the nipple is very ſpongy and elaſtic: its external ſurface is uneven, and full of ſmall tubercles. The nipple is ſurrounded with a diſk or circle of a different colour, called the *areola*; and on the inſide of the ſkin, under the areola, are many ſebaceous glands, which pour out a mucus to defend the areola and nipple: for the ſkin upon theſe parts is very thin; and the nervous papillæ lying very bare, are much expoſed to irritation.

The breaſts are formed for the ſecretion of milk, which is deſtined for the nouriſhment of the child for ſome time after its birth. This ſecretion begins to take place ſoon after delivery, and continues to flow for many months in very large quantities, if the woman ſuckles her child.

The operation of ſuction depends on the principles of the air-pump, and the flow of milk through the lactiferous tubes is facilitated by their being ſtretched out.

The milk, examined chemically, appears to be compoſed of oil, mucilage, and water, and of a conſiderable quantity of ſugar. The generality of phyſiologiſts have ſuppoſed that, like the chyle, it frequently retains the properties of the aliment and medicines taken into the ſtomach; but from ſome late experiments *, this ſuppoſition appears to be ill-founded.

SECT. II. *Of the Pleura.*

113. THE cavity of the thorax is every where lined by a membrane of a firm texture called *pleura*. It is compoſed of two diſtinct portions or bags, which, by being applied to each other laterally, form a ſeptum called *mediaſtinum*; which divides the cavity into two parts, and is attached poſteriorly to the vertebræ of the back, and anteriorly to the ſternum. But the two laminæ of which this ſeptum is formed, do not every where adhere to each other; for at the lower part of the thorax they are ſeparated, to afford a lodgment to the heart; and at the upper part of the cavity, they receive between them the thymus.

The pleura is plentifully ſupplied with arteries and veins from the internal mammary and the intercoſtals. Its nerves, which are very inconſiderable, are derived chiefly from the dorſal and intercoſtal nerves.

The ſurface of the pleura, like that of the peritonæum and other membranes lining cavities, is conſtantly bedewed with a ſerous moiſture (w) which prevents adheſion of the viſcera.

The mediaſtinum, by dividing the breaſt into two cavities, obviates many inconveniences, to which we ſhould otherwiſe be liable. It prevents the two lobes of the lungs from compreſſing each other when we lie on one ſide; and conſequently contributes to the freedom of reſpiration, which is diſturbed by the leaſt preſſure on the lungs. If the point of a ſword penetrates between the ribs into the cavity of the thorax, the lungs on that ſide ceaſe to perform their office; becauſe the air being admitted through the wound, prevents the dilatation of that lobe; while the other lobe, which is ſeparated from it by the mediaſtinum, remains unhurt, and continues to perform its function as uſual.

SECT. II. *Of the Thymus.*

114. THE *thymus* is a glandular ſubſtance, the uſe of which is not perfectly aſcertained, its excretory duct not having yet been diſcovered. It is of an oblong figure,

* *Journ. de Med.* 1781.

(w) When this fluid is exhaled in too great a quantity, or is not properly carried off, it accumulates and conſtitutes the hydrops pectoris.

figure, and is larger in the fœtus and in young children than in adults, being ſometimes nearly effaced in very old ſubjects. It is placed in the upper part of the thorax, between the two laminæ of the mediaſtinum; but at firſt is not altogether contained within the cavity of the cheſt, being found to border upon the upper extremity of the ſternum.

Sect. IV. *Of the Diaphragm.*

115. The cavity of the thorax is ſeparated from that of the abdomen, by a fleſhy and membranous ſubſtance called the *diaphragm* or *midriff*. The greateſt part of it is compoſed of muſcular fibres; and on this account ſyſtematic writers uſually place it very properly among the muſcles. Its middle part is tendinous, and it is covered by the pleura above, and by the peritonæum below. It ſeems to have been improperly named *ſeptum tranſverſum*, as it does not make a plane tranſverſe diviſion of the two cavities, but forms a kind of vault, the fore-part of which is attached to the ſternum. Laterally it is fixed to the laſt of the true ribs, and to all the falſe ribs; and its lower and poſterior part is attached to the vertebræ lumborum, where it may be ſaid to be divided into two portions or crura (x).

The principal arteries of the diaphragm are derived from the aorta, and its veins paſs into the vena cava. Its nerves are chiefly derived from the cervical pairs. It affords a paſſage to the vena cava through its tendinous part, and to the œſophagus through its fleſhy portion. The aorta paſſes down behind it between its crura.

The diaphragm not only ſerves to divide the thorax from the abdomen, but by its muſcular ſtructure is rendered one of the chief agents in reſpiration. When its fibres contract, its convex ſide, which is turned towards the thorax, becomes gradually flat, and by increaſing the cavity of the breaſt, affords room for a complete dilatation of the lungs, by means of the air which is then drawn into them by the act of inſpiration. The fibres of the diaphragm then relax; and as it reſumes its former ſtate, the cavity of the thorax becomes gradually diminiſhed, and the air is driven out again from the lungs by a motion contrary to the former one, called *exſpiration*.

It is in ſome meaſure, by means of the diaphragm, that we void the fæces at the anus, and empty the urinary bladder. Beſides theſe offices, the acts of coughing, ſneezing, ſpeaking, laughing, gaping, and ſighing, could not take place without its aſſiſtance; and the gentle preſſure which all the abdominal viſcera receive from its conſtant and regular motion, cannot fail to aſſiſt in the performance of the ſeveral functions which were aſcribed to thoſe viſcera.

Sect. V. *Of the Trachea.*

116. The trachea or windpipe, is a cartilaginous and membranous canal, through which the air paſſes into the lungs. Its upper part, which is called the *larynx*, is compoſed of five cartilages. The uppermoſt of theſe cartilages is placed over the glottis or mouth of the larynx, and is called *epiglottis*, which has been before ſpoken of, as cloſing the paſſage to the lungs in the act of ſwallowing. At the ſides of the glottis are placed the two arytenoide cartilages, which are of a very complex figure, not eaſy to be deſcribed. The anterior and larger part of the larynx is made up of two cartilages; one of which is called *thyroides* or *ſcutiformis*, from its being ſhaped like a buckler; and the other *cricoides* or *annularis*, from its reſembling a ring. Both theſe cartilages may be felt immediately under the ſkin, at the fore-part of the throat, and the thyroides, by its convexity, forms an eminence called *pomum adami*, which is uſually more conſiderable in the male than in the female ſubject.

All theſe cartilages are united to each other by means of very elaſtic, ligamentous fibres; and are enabled, by the aſſiſtance of their ſeveral muſcles, to dilate or contract the paſſage of the larynx, and to perform that variety of motion which ſeems to point out the larynx as the principal organ of the voice; for when the air paſſes out through a wound in the trachea, it produces no ſound.

Theſe cartilages are moiſtened by a mucus, which ſeems to be ſecreted by minute glands ſituated near them. The upper part of the trachea is covered anteriorly and laterally by a conſiderable body, which is ſuppoſed to be of a glandular ſtructure, and from its ſituation near the thyroid cartilage is called the *thyroid gland*; though its excretory duct has not yet been diſcovered, or its uſe aſcertained.

The glottis is interiorly covered by a very fine membrane, which is moiſtened by a conſtant ſupply of a watery fluid. From the larynx the canal begins to take the name of *trachea* or *aſpera arteria*, and extends from thence as far down as the third or fourth vertebra of the back, where it divides into two branches, which are the right and left bronchial tube. Each of theſe bronchi (y) ramifies through the ſubſtance of that lobe of the lungs to which it is diſtributed, by an infinite number of branches, which are formed of cartilages ſeparated from each other like thoſe of the trachea, by an intervening membranous and ligamentary ſubſtance. Each of theſe cartilages is of an angular figure; and as they become gradually leſs and leſs in their diameter, the lower ones are in ſome meaſure received into thoſe above them, when the lungs, after being inflated, gradually collapſe by the air being puſhed ed out from them in exſpiration. As the branches of the bronchi become more minute, their cartilages become more and more angular and membranous, till at length they are found to be perfectly membranous, and at laſt become inviſible.

(x) Anatomical writers have uſually deſcribed the diaphragm as being made up of two muſcles united by a middle tendon; and theſe two portions or crura form what they ſpeak of as the *inferior muſcle*, ariſing from the ſides and fore-part of the vertebræ.

(y) The right bronchial tube is uſually found to be ſomewhat ſhorter and thicker than the left; and M. Portal, who has publiſhed a memoir on the action of the lungs on the aorta in reſpiration, obſerves, that the left bronchial tube is cloſely connected by the aorta; and from ſome experiments he is induced to conclude, that in the firſt reſpirations, the air only enters into the right lobe of the lungs. *Memoires de l' Academie Royale des Sciences*, 1769.

The trachea is furniſhed with fleſhy or muſcular fibres; ſome of which paſs through its whole extent longitudinally, while the others are carried round it in a circular direction; ſo that by the contraction or relaxation of theſe fibres, it is enabled to ſhorten or lengthen itſelf, and likewiſe to dilate or contract the diameter of its paſſage.

The trachea and its branches, in all their ramifications, are furniſhed with a great number of ſmall glands which are lodged in their cellular ſubſtance, and diſcharge a mucous fluid on the inner ſurface of theſe tubes.

The cartilages of the trachea, by keeping it conſtantly open, afford a free paſſage to the air, which we are obliged to be inceſſantly reſpiring; and its membranous part, by being capable of contraction and dilatation, enables us to receive and expel the air in a greater or leſs quantity, and with more or leſs velocity, as may be required in ſinging or in declamation. This membranous ſtructure of the trachea poſteriorly, ſeems likewiſe to aſſiſt in the deſcent of the food, by preventing that impediment to its paſſage down the œſophagus, which might be expected if the cartilages were complete rings.

The trachea receives its arteries from the carotid and ſubclavian arteries, and its veins paſs into the jugulars. Its nerves ariſe from the recurrent branch of the eighth pair, and from the cervical plexus.

SECT. VI. *Of the Lungs.*

THE lungs fill the greater part of the cavity of the breaſt. They are of a ſoft and ſpongy texture, and are divided into two lobes, which are ſeparated from each other by the mediaſtinum, and are externally covered by a production of the pleura. Each of theſe is divided into two or three leſſer lobes; and we commonly find three in the right ſide of the cavity, and two in the left.

To diſcover the ſtructure of the lungs, it is required to follow the ramifications of the bronchi, which were deſcribed in the laſt ſection. Theſe becoming gradually more and more minute, at length terminate in the cellular ſpaces or veſicles, which make up the greateſt part of the ſubſtance of the lungs, and readily communicate with each other.

The lungs ſeem to poſſeſs but little ſenſibility. Their nerves, which are ſmall, and few in number, are derived from the intercoſtal and eighth pair. This laſt pair having reached the thorax, ſends off a branch on each ſide of the trachea, called the *recurrent*, which reaſcends at the back of the trachea, to which it furniſhes branches in its aſcent, as well as to the œſophagus, but it is chiefly diſtributed to the larynx and its muſcles. By dividing the recurrent and ſuperior laryngeal nerves at their origin, an animal is deprived of its voice.

There are two ſeries of arteries which carry blood to the lungs: theſe are the arteriæ bronchiales, and the pulmonary artery.

The arteriæ bronchiales begin uſually by two branches; one of which commonly ariſes from the right intercoſtal, and the other from the trunk of the aorta: but ſometimes there are three of theſe arteries, and in ſome ſubjects only one. The uſe of theſe arteries is to ſerve for the nouriſhment of the lungs, and their ramifications are ſeen creeping every where on the branches of the bronchi. The blood is brought back from them by the bronchial vein into the vena azygos.

The pulmonary artery and vein are not intended for the nouriſhment of the lungs; but the blood in its paſſage through them is deſtined to undergo ſome changes, or to acquire certain eſſential properties (from the action of the air), which it has loſt in its circulation through the other parts of the body. The pulmonary artery receives the blood from the right ventricle of the heart, and dividing into two branches, accompanies the bronchi every where, by its ramifications through the lungs; and the blood is afterwards conveyed back by the pulmonary vein, which gradually forming a conſiderable trunk, goes to empty itſelf into the left ventricle of the heart; ſo that the quantity of blood which enters into the lungs, is perhaps greater than that which is ſent in the ſame proportion of time through all the other parts of the body.

SECT. VII. *Of Reſpiration.*

RESPIRATION conſtitutes one of thoſe functions which are properly termed *vital*, as being eſſential to life; for to live and to breathe are in fact ſynonymous terms. It conſiſts in an alternate contraction and dilatation of the thorax, by firſt inſpiring air into the lungs, and then expelling it from them in exſpiration.

It will perhaps be eaſy to diſtinguiſh and point out the ſeveral phenomena of reſpiration; but to explain their phyſical cauſe will be attended with difficulty: for it will naturally be enquired, how the lungs, when emptied of the air, and contracted by exſpiration, become again inflated, they themſelves being perfectly paſſive? How the ribs are elevated in oppoſition to their own natural ſituation? and why the diaphragm is contracted downwards towards the abdomen? Were we to aſſert that the air, by forcing its way into the cavity of the lungs, dilated them, and conſequently elevated the ribs, and preſſed down the diaphragm, we ſhould ſpeak erroneouſly. What induces the firſt inſpiration, it is not eaſy to aſcertain; but after an animal has once reſpired, it would ſeem likely that the blood, after exſpiration, finding its paſſage through the lungs obſtructed, becomes a ſtimulus, which induces the intercoſtal muſcles and the diaphragm to contract, and enlarge the cavity of the thorax, in conſequence perhaps of a certain nervous influence, which we will not here attempt to explain. The air then ruſhes into the lungs; every branch of the bronchial tubes, and all the cellular ſpaces into which they open, become fully dilated; and the pulmonary veſſels being equally diſtended, the blood flows through them with eaſe. But as the ſtimulus which firſt occaſioned this dilatation ceaſes to operate, the muſcles gradually contract, the diaphragm riſes upwards again, and diminiſhes the cavity of the cheſt; the ribs return to their former ſtate; and as the air paſſes out in exſpiration, the lungs gradually collapſe, and a reſiſtance to the paſſage of the blood again takes place. But the heart continuing to receive and expel the blood, the pulmonary artery begins again to be diſtended, the ſtimulus is renewed, and the ſame proceſs is repeated, and continues to be repeated, in a regular ſucceſſion, during life: for though the muſcles of reſpiration, having a mixed motion, are (unlike the heart) in ſome meaſure dependent on the will, yet no human being, after having once reſpired, can live many moments without it. In an attempt to hold one's breath, the blood ſoon begins to diſtend the veins, which are unable to empty their contents into the heart; and we are able only, during a very little time, to reſiſt the ſtimulus to inſpiration. In drowning, the circulation ſeems to be ſtopped upon this principle; and in hanging, the preſſure made on the jugular veins, may cooperate with the ſtoppage of reſpiration in bringing on death.

Till within theſe few years phyſiologiſts were entirely ignorant of the uſe of reſpiration. It was at length diſcovered in part by the illuſtrious Dr Prieſtley. He found that the air exſpired by animals was phlogiſticated; and that the air was fitter for reſpiration, or for ſupporting animal life, in proportion as it was freer from the phlogiſtic principle. It had long been obſerved, that the blood in paſſing through the lungs acquired a more florid colour. He therefore ſuſpected, that it was owing to its having imparted phlogiſton to the air: and he ſatisfied himſelf of the truth of this idea, by experiments, which ſhowed, that the craſſementum of extravaſated blood, phlogiſticated air in proportion as it loſt its dark colour. He farther found, that blood thus reddened had a ſtrong attraction for phlogiſton; inſomuch that it was capable of taking it from phlogiſticated air, thereby becoming of a darker colour. From hence it appeared that the blood, in its circulation through the arterial ſyſtem, imbibes a conſiderable quantity of phlogiſton, which is diſcharged from it to the air in the lungs.

This diſcovery has ſince been proſecuted by two very ingenious phyſiologiſts, Dr Crawford and Mr Elliot. It had been ſhown by profeſſors Black and Irvine, that different bodies have different capacities for containing fire. For example, that oil and water, when equally hot to the ſenſe and the thermometer, contain different proportions of that principle; and that unequal quantities of it are required, in order to raiſe thoſe ſubſtances to like temperatures. The enquiries of Dr Crawford and Mr Elliot tend to prove, that the capacities of bodies for containing fire are diminiſhed by the addition of phlogiſton, and increaſed by its ſeparation: the capacity of calx of antimony, for example, being greater than that of the antimony itſelf. Common air contains a great quantity of fire; combuſtible bodies very little. In combuſtion, a double elective attraction takes place; the phlogiſton of the body being transferred to the air, the fire contained in the air to the combuſtible body. But as the capacity of the latter is not increaſed ſo much as that of the former is diminiſhed, only part of the extricated fire will be abſorbed by the body. The remainder therefore will raiſe the temperature of the compound; and hence we may account for the heat attending combuſtion. As the uſe of reſpiration is to dephlogiſticate the blood, it ſeems probable, that a like double elective attraction takes place in this proceſs; the phlogiſton of the blood being transferred to the air, and the fire contained in the air to the blood; but with this difference, that the capacities being equal, the whole of the extricated fire is abſorbed by the latter. The blood in this ſtate circulating through the body, imbibes phlogiſton, and of courſe gives out its fire; part only of which is abſorbed by the parts furniſhing the phlogiſton, the remainder, as in combuſtion, becoming ſenſible; and is therefore the cauſe of the heat of the body, or what is called animal heat.

In confirmation of this doctrine it may be obſerved, that the venous blood contains leſs fire than the arterial; combuſtible bodies leſs than incombuſtible ones; and that air contains leſs of this principle, according as it is rendered, by combination with phlogiſton, leſs fit for reſpiration (z).

In aſcending very high mountains, reſpiration is found to become ſhort and frequent, and ſometimes to be attended with a ſpitting of blood. Theſe ſymptoms ſeem to be occaſioned by the air being too rare and thin to dilate the lungs ſufficiently; and the blood gradually accumulating in the pulmonary veſſels, ſometimes burſts through their coats, and is brought up by coughing. This has likewiſe been accounted for in a different way, by ſuppoſing that the air contained in the blood, not receiving an equal preſſure from that of the atmoſphere, expands, and at length ruptures the very minute branches of the pulmonary veſſels; upon the ſame principle that fruits and animals put under the receiver of an air-pump, are ſeen to ſwell as the outer air becomes exhauſted. But Dr Darwin of Litchfield has lately publiſhed ſome experiments, which ſeem to prove, that no air or elaſtic vapour does exiſt in the blood-veſſels, as has been generally ſuppoſed; and he is induced to impute the ſpitting of blood, which has ſometimes taken place in aſcending high mountains, to accident, or to violent exertions; as it never happens to animals that are put into the exhauſted receiver of an air-pump, where the diminution of preſſure is many times greater than on the ſummit of the higheſt mountains.

SECT. VIII. *Of the Voice.*

RESPIRATION has already been deſcribed as affording us many advantages; and next to that of life, its moſt important uſe ſeems to be that of forming the voice and ſpeech. The ancients, and almoſt all the moderns, have conſidered the organ of ſpeech as a kind of muſical inſtrument, which may be compared to a flute, to an hautboy, to an organ, &c. and they argue after the following manner.

The trachea, which begins at the root of the tongue, and goes to terminate in the lungs, may be compared to the pipe of an organ, the lungs dilating like bellows during the time of inſpiration; and as the air is driven out from them in exſpiration, it finds its paſſage ſtraitened by the cartilages of the larynx, againſt which it ſtrikes. As theſe cartilages are more or leſs elaſtic, they occaſion in their turn more or leſs vibration in the air, and thus produce the ſound of the voice; the variation in the ſound and tone of which depends on the ſtate of the glottis, which, when ſtraitened, produces an acute tone, and a grave one when dilated.

(z) See Crawford's Experiments and Obſervations on Animal Heat, and Elliot's Philoſophical Obſervations.

The late M. Ferein communicated to the French Academy of Sciences a very ingenious theory on the formation of the voice. He conſidered the organ of the voice as a *ſtring*, as well as a *wind*, inſtrument; ſo that what art has hitherto been unable to conſtruct, and what both the fathers Merſenne and Kircher ſo much wiſhed to ſee, M. Ferein imagined he had at length diſcovered in the human body. He obſerves, that there are at the edges of the glottis certain tendinous chords, placed horizontally acroſs it, which are capable of conſiderable vibration, ſo as to produce ſound, in the ſame manner as it is produced by the ſtrings of a violin or a harpſichord: and he ſuppoſes that the air, as it paſſes out from the lungs, acts as a bow on theſe ſtrings, while the efforts of the breaſt and lungs regulate its motion, and produce the variety of tones. So that according to this ſyſtem the variation in the voice is not occaſioned by the dilatation or contraction of the glottis, but by the diſtenſion or relaxation of theſe ſtrings, the ſound being more or leſs acute in proportion as they are more or leſs ſtretched out. Another writer on this ſubject ſuppoſes, that the organ of voice is a double inſtrument, which produces in uniſon two ſounds of a different nature; one by means of the air, and the other by means of the chords of the glottis. Neither of theſe ſyſtems, however, are univerſally adopted. They are both liable to inſuperable difficulties; ſo that the manner in which the voice is formed has never yet been ſatisfactorily aſcertained: we may obſerve, however, that the ſound produced by the glottis is not articulated. To effect this, it is required to paſs through the mouth, where it is differently modified by the action of the tongue, which is either puſhed againſt the teeth, or upwards towards the palate; detaining it in its paſſage, or permitting it to flow freely, by contracting or dilating the mouth.

Sect. IX. *Of Dejection.*

120 By dejection we mean the act of voiding the fæces at the anus; and an account of the manner in which this is conducted was reſerved for this part of the work, becauſe it ſeemed to require a knowledge of reſpiration to be perfectly underſtood.

The inteſtines were deſcribed as having a periſtaltic motion, by which the fæces were gradually advancing towards the anus. Now, whenever the fæces are accumulated in the inteſtinum rectum in a ſufficient quantity to become troubleſome, either by their weight or acrimony, they excite a certain uneaſineſs which induces us to go to ſtool.—To effect this, we begin by making a conſiderable inſpiration; in conſequence of which the diaphragm is carried downwards towards the lower belly; the abdominal muſcles are at the ſame time contracted in obedience to the will; and the inteſtines being compreſſed on all ſides, the reſiſtance of the *ſphincter* is overcome, and the fæces paſs out at the anus; which is afterwards drawn up by its longitudinal fibres, which are called *levatores ani*, and then by means of its *ſphincter* is again contracted: but it ſometimes happens, as in dyſenteries for inſtance, that the fæces are very liquid, and have conſiderable acrimony; and then the irritation they occaſion is more frequent, ſo as to promote their diſcharge without any preſſure from the diaphragm or abdominal muſcles; and ſometimes involuntarily, as is the caſe when the ſphincter becomes paralytic.

Sect. X. *Of the Pericardium, and of the Heart and its Auricles.*

121 Pericardium. The two membranous bags of the pleura, which were deſcribed as forming the mediaſtinum, recede one from the other, ſo as to afford a lodgment to a firm membranous ſac, in which the heart is ſecurely lodged; this ſac, which is the *pericardium*, appears to be compoſed of two tunics, united to each other by cellular membrane.—The outer coat, which is thick, and in ſome places of tendinous complexion, is a production of the mediaſtinum; the inner coat, which is extremely thin, is reflected over the auricles and ventricles of the heart, in the ſame manner as the tunica conjunctiva, after lining the eye lids, is reflected over the eye.

This bag adheres to the tendinous part of the diaphragm, and contains a coagulable lymph, the *liquor pericardii*, which ſerves to lubricate the heart and facilitate its motions; and ſeems to be ſecreted and abſorbed in the ſame manner as it is in the other cavities of the body.

The arteries of the pericardium are derived from the phrenic, and its veins paſs into veins of the ſame name; its nerves are likewiſe branches of the phrenic.

The ſize of the pericardium is adapted to that of the heart, being uſually large enough to contain it looſely. As its cavity does not extend to the ſternum, the lungs cover it in inſpiration; and as it every where inveſts the heart, it effectually ſecures it from being injured by lymph, pus, or any other fluid, extravaſated into the cavities of the thorax.

122 Heart, and its auricles. The heart is a hollow muſcle of a conical ſhape, ſituated tranſverſely between the two laminæ of the mediaſtinum, at the lower part of the thorax; having its baſis turned towards the right ſide, and its point or apex towards the left.—Its lower ſurface is ſomewhat flattened towards the diaphragm. Its baſis, from which the great veſſels originate, is covered with fat, and it has two hollow and fleſhy appendages, called *auricles*.—Round theſe ſeveral openings, the heart ſeems to be of a firm ligamentous texture, from which all its fibres ſeem to originate; and as they advance from thence towards the apex, the ſubſtance of the heart ſeems to become thinner.

The heart includes two cavities of *ventricles*, which are ſeparated from each other by a fleſhy ſeptum; one of theſe is called the *right*, and the other the *left, ventricle*; though perhaps, with reſpect to their ſituation, it would be more proper to diſtinguiſh them into the *anterior* and *poſterior ventricles*.

The heart is exteriorly covered by a very fine membrane; and its ſtructure is perfectly muſcular or fleſhy, being compoſed of fibres which are deſcribed as paſſing in different directions; ſome as being extended longitudinally from the baſis to the apex; others, as taking an oblique or ſpiral courſe; and a third ſort as being placed in a tranverſe direction (A).—Within the two ventricles we obſerve ſeveral furrows; and there are likewiſe tendinous ſtrings, which ariſe from fleſhy *columnæ* in the two cavities, and are attached to the valves of the auricles: That the uſe of theſe and the other valves of the heart may be underſtood, it muſt be obſerved, that four large veſſels paſs out from the baſis of the heart, viz. two arteries and two veins; and that each of theſe veſſels is furniſhed with a thin membranous production, which is attached all round to the borders of their ſeveral orifices, from whence hanging looſely down they appear to be divided into two or three diſtinct portions. But as their uſes in the arteries and veins are different, ſo are they differently diſpoſed. Thoſe of the arteries are intended to give way to the paſſage of the blood into them from the ventricles, but to oppoſe its return: and, on the contrary, the valves of the veins are conſtructed ſo as to allow the blood only to paſs into the heart. In conſequence of theſe different uſes, we find the valves of the pulmonary artery and of the aorta attached to the orifices of thoſe veſſels, ſo as to have their concave ſurfaces turned towards the artery; and their convex ſurfaces, which mutually meet together, being placed towards the ventricle, only permit the blood to paſs one way, which is into the arteries. There are uſually three of theſe valves belonging to the pulmonary artery, and as many to the aorta; and from their figure they are called *valvulæ ſemilunares*. The communication between the two great veins and the ventricles is by means of the two appendages or auricles into which the blood is diſcharged; ſo that the other valves which may be ſaid to belong to the veins, are placed in each ventricle, where the auricle opens into it. The valves in the right ventricle are uſually three in number, and are named *valvulæ tricuſpides*; but in the left ventricle we commonly obſerve only two, and theſe are the *valvulæ mitrales*. The membranes which form theſe valves in each cavity are attached ſo as to project ſomewhat forward; and both the *tricuſpides* and the *mitrales* are connected with the tendinous ſtrings, which were deſcribed as ariſing from the fleſhy *columnæ*. By the contraction of either ventricle, the blood is driven into the artery which communicates with that ventricle; and theſe tendinous ſtrings being gradually relaxed as the ſides of the cavity are brought nearer to each other, the valves naturally cloſe the opening into the auricle, and the blood neceſſarily directs its courſe into the then only open paſſage, which is into the artery; but after this contraction, the heart becomes relaxed, the tendinous ſtrings are again ſtretched out, and, drawing the valves of the auricle downwards, the blood is poured by the veins into the ventricle, from whence, by another contraction, it is again thrown into the artery, as will be deſcribed hereafter. The right ventricle is not quite ſo long, though ſomewhat larger, than the left; but the latter has more ſubſtance than the other: and this ſeems to be, becauſe it is intended to tranſmit the blood to the moſt diſtant parts of the body, whereas the right ventricle diſtributes it only to the lungs.

The heart receives its nerves from the par vagum and the intercoſtals. The arteries which ſerve for its nouriſhment are two in number, and ariſe from the aorta. They ſurround in ſome meaſure the baſis of the heart, and from this courſe are called the *coronary arteries*. From theſe arteries the blood is returned by veins of the ſame name into the auricles, and even into the ventricles.

The muſcular bags called the *auricles* are ſituated at the baſis of the heart, at the ſides of each other; and, correſponding with the two ventricles, are like thoſe two cavities diſtinguiſhed into *right* and *left*. Theſe ſacs, which are interiorly unequal, have externally a jagged appendix; which, from its having been compared to the extremity of an ear, has given them their name of *auricles*.

SECT. XI. *Angiology, or a Deſcription of the Blood-veſſels.*

123 THE heart has been deſcribed as contracting itſelf, and throwing the blood from its two ventricles into the pulmonary artery and the aorta, and then as relaxing itſelf and receiving a freſh ſupply from two large veins, which are the pulmonary vein and the vena cava. We will now point out the principal diſtributions of theſe veſſels.

The *pulmonary artery* ariſes from the right ventricle by a large trunk, which ſoon divides into two conſiderable branches, which paſs to the right and left lobes of the lungs: each of theſe branches is afterwards divided and ſubdivided into an infinite number of branches and ramifications, which extend through the whole ſubſtance of the lungs; and from theſe branches the blood is returned by the veins, which, contrary to the courſe of the arteries, begin by very minute canals, and gradually become larger, forming at length four large trunks called *pulmonary veins*, which terminate in the *left auricle* by one common opening, from whence the blood paſſes into the *left ventricle*. From this ſame ventricle ariſes the *aorta* or *great artery*, which at its beginning is nearly an inch in diameter: it ſoon ſends off two branches, the *coronaries*, which go to be diſtributed to the heart and its auricles. After this, at or about the third or fourth vertebra of the back, it makes a conſiderable curvature; from this curvature (B) ariſe three arteries; one of which ſoon divides into two branches. The firſt two are the left ſubclavian and the left carotid, and the third is a common trunk to the right ſubclavian and right carotid; though ſometimes both the carotids ariſe diſtinctly from the aorta.

The two *carotids* aſcend within the ſubclavians, along the ſides of the trachea; and when they have reached the larynx, divide into two principal branches, the *internal* and *external carotid*. The firſt of theſe runs a little

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(A) Authors differ about the courſe and diſtinctions of theſe fibres; and it ſeems right to obſerve, that the ſtructure of the heart being more compact than that of other muſcles, its fibres are not eaſily ſeparated.

(B) Anatomiſts uſually call the upper part of this curvature *aorta aſcendens*; and the other part of the artery to its diviſion at the iliacs, *aorta deſcendens*: but they differ about the place where this diſtinction is to be introduced; and it ſeems ſufficiently to anſwer every purpoſe, to ſpeak only of the aorta and its curvature.

little way backwards in a bending direction; and having reached the under part of the ear, paſſes through the canal into the os petroſum, and entering into the cavity of the cranium, is diſtributed to the brain and the membranes which invelope it, and likewiſe to the eye. The *external carotid* divides into ſeveral branches, which are diſtributed to the larynx, pharynx, and other parts of the neck; and to the jaws, lips, tongue, eyes, temples, and all the external parts of the head.

Each *ſubclavian* is likewiſe divided into a great number of branches. It ſends off the *vertebral artery*, which paſſes through the openings we ſee at the bottom of the tranſverſe proceſſes of the vertebræ of the neck, and in its courſe ſends off many ramifications to the neighbouring parts. Some of its branches are diſtributed to the ſpinal marrow, and after a conſiderable inflection it enters into the cranium, and is diſtributed to the brain. The *ſubclavian* likewiſe ſends off branches to the muſcles of the neck and ſcapula; and the mediaſtinum, thymus, pericardium, diaphragm, the breaſts, and the muſcles of the thorax, and even of the abdomen, derive branches from the ſubclavian, which are diſtinguiſhed by different names, alluding to the parts to which they are diſtributed; as the *mammary*, the *phrenic*, the *intercoſtal*, &c. But notwithſtanding the great number of branches which have been deſcribed as ariſing from the ſubclavian, it is ſtill a conſiderable artery when it reaches the *axilla*, where it drops its former name, which alludes to its paſſage under the clavicle, and is called the *axillary* artery; from which a variety of branches are diſtributed to the muſcles of the breaſt, ſcapula, and arm.—But its main trunk taking the name of *brachialis*, runs along on the inſide of the arm near the os humeri, till it reaches the joint of the fore-arm, and then it divides into two branches. This diviſion however is different in different ſubjects; for in ſome it takes place higher up and in others lower down. When it happens to divide above the joint, it may be conſidered as a happy diſpoſition in caſe of an accident by bleeding; for ſuppoſing the artery to be unfortunately punctured by the lancet, and that the hæmorrhage could only be ſtopped by making a ligature on the veſſel, one branch would remain unhurt, through which the blood would paſs uninterrupted to the fore-arm and hand. One of the two branches of the brachialis plunges down under the flexor muſcles, and runs along the edge of the ulna; while the other is carried along the outer ſurface of the radius, and is eaſily felt at the wriſt, where it is only covered by the common integuments. Both theſe branches commonly unite in the palm of the hand, and form an arterial arch from whence branches are detached to the fingers.

The *aorta*, after having given off at its curvature the carotids and ſubclavians which convey blood to all the upper parts of the body, deſcends upon the bodies of the vertebræ a little to the left, as far as the os ſacrum, where it drops the name of *aorta*, and divides into two conſiderable branches. In this courſe, from its curvature to its bifurcation, it ſends off ſeveral arteries in the following order: 1. One or two little arteries, firſt demonſtrated by Ruyſch as going to the bronchi, and called *arteriæ bronchinales Ruyſchii*. 2. The arteriæ œſophageæ. Theſe are commonly three or four in number. They ariſe from the fore-part of the aorta, and are diſtributed chiefly to the œſophagus. 3. The inferior intercoſtal arteries, which are diſtributed between the ribs in the ſame manner as the arteries of the three or four ſuperior ribs are, which are derived from the ſubclavian. Theſe arteries ſend off branches to the medulla ſpinalis. 4. The diaphragmatic or inferior phrenic arteries, which go to the diaphragm, ſtomach, omentum, duodenum, pancreas, ſpleen, liver, and gall-bladder. 5. The cœliac, which ſends off the coronary-ſtomachic, the ſplenic, and the hepatic artery. 6. The ſuperior meſenteric artery, which is diſtributed to the meſentery and ſmall inteſtines. 7. The emulgents, which go to the kidneys. 8. The arteries, which are diſtributed to the glandulæ renales. 9. The ſpermatic. 10. The inferior meſenteric artery, which ramifies through the lower portion of the meſentery and the large inteſtines.—A branch of this artery which goes to the rectum is called the *internal hæmorrhoidal*. 11. The lumbar arteries, and a very ſmall branch called the *ſacra*, which are diſtributed to the muſcles of the loins and abdomen, and to the os ſacrum and medulla ſpinalis.

The trunk of the aorta, when it has reached the laſt vertebra lumborum, or the os ſacrum, drops the name of *aorta*, and ſeparates into two forked branches called the *iliacs*. Each of theſe ſoon divides into two branches; one of which is called the *internal iliac*, or *hypogaſtic artery*, and is diſtributed upon the contents of the pelvis and upon the muſcles on its outer ſide. One branch, called *pudenda communis*, ſends ſmall ramifications to the end of the rectum under the name of *hæmorrhoidales externæ*, and is afterwards diſtributed upon the penis. The other branch, the external iliac, after having given off the circumflex artery of the os ilium and the epigaſtric, which is diſtributed to the recti-muſcles, paſſes out of the abdomen under Poupart's ligament, and takes the name of *crural artery*. It deſcends on the inner part of the thigh cloſe to the os femoris, ſending off branches to the muſcles, and then ſinking deeper in the hind part of the thigh, reaches the ham, where it takes the name of *popliteal*: after this it ſeparates into two conſiderable branches; one of which is called the *anterior tibial artery*; the other divides into two branches, and theſe arteries all go to be diſtributed to the leg and foot.

The blood, which is thus diſtributed by the aorta to all parts of the body, is brought back by the veins, which are ſuppoſed to be continued from the ultimate branches of arteries; and uniting together as they approach the heart, at length form the large trunks, the vena cava aſcendens, and vena cava deſcendens.

All the veins which bring back the blood from the upper extremities, and from the head and breaſt, paſs into the vena cava deſcendens; and thoſe which return it from the lower parts of the body terminate in the vena cava aſcendens; and theſe two cavas uniting together as they approach the heart, open by one common orifice into the left auricle.

It does not here ſeem to be neceſſary to follow the different diviſions of the veins as we did thoſe of the arteries; and it will be ſufficient to remark, that in general every artery is accompanied by its vein, and that both are diſtinguiſhed by the ſame name. But, like many other general rules, this too has its exceptions (c). The veins for inſtance, which accompany the external and internal carotid, are not called the *carotid veins*, but the *external* and *internal jugular*.—In the thorax, there is a vein diſtinguiſhed by a proper name, and this is the *azygos*, or *vena ſine pari*. This vein, which is a pretty conſiderable one, runs along by the right ſide of the vertebræ of the back, and is chiefly deſtined to receive the blood from the intercoſtals on that ſide, and from the lower half of thoſe on the left ſide, and to convey it into the vena cava deſcendens. In the abdomen we meet with a vein, which is ſtill a more remarkable one, and this is the *vena portæ*, which performs the office both of an artery and a vein. It is formed by a re-union of all the veins which come from the ſtomach, inteſtines, omentum, pancreas, and ſpleen, ſo as to compoſe one great trunk, which goes to ramify through the liver; and after having depoſited the bile, its ramifications unite and bring back into the vena cava, not only the blood which the vena portæ had carried into the liver, but likewiſe the blood from the hepatic artery. Every artery has a vein which correſponds with it; but the trunks and branches of the veins are more numerous than thoſe of the arteries.—The reaſons for this diſpoſition are perhaps more difficult to be explained; the blood in its courſe through the veins is much farther removed from the ſource and cauſe of its motion, which are in the heart, than it was when in the arteries; ſo that its courſe is conſequently leſs rapid, and enough of it could not poſſibly be brought back to the heart in the moment of its dilatation, to equal the quantity which is driven into the arteries from the two ventricles, at the time they contract; and the equilibrium which is ſo eſſential to the continuance of life and health would conſequently be deſtroyed, if the capacity of the veins did not exceed that of the arteries, in the ſame proportion that the rapidity of the blood's motion through the arteries exceeds that of its return through the veins.

A large artery ramifying through the body, and continued to the minute branches of veins, which gradually unite together to form a large trunk, may be compared to two trees united to each other at their tops; or rather as having their ramifications ſo diſpoſed that the two trunks terminate in one common point; and if we farther ſuppoſe, that both theſe trunks and their branches are hollow, and that a fluid is inceſſantly circulated through them, by entering into one of the trunks and returning through the other, we ſhall be enabled to conceive how the blood is circulated through the veſſels of the human body.

Every trunk of an artery, before it divides, is nearly cylindrical, or of equal diameter through its whole length, and ſo are all its branches when examined ſeparately. But every trunk ſeems to contain leſs blood than the many branches do into which that trunk ſeparates; and each of theſe branches probably contains leſs blood than the ramifications do into which it is ſubdivided: and it is the ſame with the veins; the volume of their ſeveral ramifications, when conſidered together, being found to exceed that of the great trunk which they form by their union.

The return of the blood through the veins to the heart, is promoted by the action of the muſcles, and the pulſation of the arteries. And this return is likewiſe greatly aſſiſted by the *valves* which are to be met with in the veins, and which conſtitute one of the great diſtinctions between them and the arteries. Theſe valves, which are ſuppoſed to be formed by the inner coat of the veins, permit the blood to flow from the extremities towards the heart, but oppoſe its return. They are moſt frequent in the ſmaller veins. As the column of blood increaſes, they ſeem to become leſs neceſſary; and therefore in the vena cava aſcendens, we meet with only one valve, which is near its origin.

The arteries are compoſed of ſeveral tunics. Some writers enumerate five of theſe tunics; but perhaps we may more properly reckon only three, viz. the *nervous*, *muſcular*, and *cuticular* coats. The veins are by ſome anatomiſts deſcribed as having the ſame number of coats as the arteries; but as they do not ſeem to be irritable, we cannot with propriety ſuppoſe them to have a muſcular tunic. We are aware of Dr Verſchuir's * experiments to prove that the jugular and ſome other veins poſſeſs a certain degree of irritability; but it is certain, that his experiments, repeated by others, have produced a different reſult; and even he himſelf allows, that ſometimes he was unable to diſtinguiſh any ſuch property in the veins. Both theſe ſeries of veſſels are nouriſhed by ſtill more minute arteries and veins, which are ſeen creeping over their coats, and ramifying through their whole ſubſtance, and are called *vaſa vaſorum*; they have likewiſe many minute branches of nerves.

* *De Arteriarum et Venarum vi irritabili*, 4to.

The arteries are much ſtronger than the veins, and they ſeem to require this force to be enabled to reſiſt the impetus with which the blood circulates through them, and to impel it on towards the veins.

When the heart contracts, it impels the blood into the arteries, and ſenſibly diſtends them; and theſe veſſels again contract, as the heart becomes relaxed to receive more blood from the auricles; ſo that the cauſe of the contraction and dilatation of the arteries ſeems to be eaſy to be underſtood, being owing in part to their own contractile power, and in part to the action of the heart; but in the *veins*, the effects of this impulſe not being ſo ſenſibly felt, and the veſſels themſelves having little or no contractile power, the blood ſeems to flow in a conſtant and equal ſtream: and this, together with its paſſing gradually from a ſmall channel into a larger one, ſeems to be the reaſon why the *veins* have no pulſatory motion, except the large ones near the heart; and in theſe it ſeems to be occaſioned by the motion of the diaphragm, and by the regurgitation of the blood in the *cavas*.

(c) In the extremities, ſome of the deep-ſeated veins, and all the ſuperficial ones, take a courſe different from that of the arteries.

Sect. XII. *Of the Action of the Heart, Auricles, and Arteries.*

124. **The** heart, at the time it contracts, drives the blood from its ventricles into the arteries; and the arteries being thus filled and diſtended, are naturally inclined to contract the moment the heart begins to dilate, and ceaſes to ſupply them with blood. Theſe alternate motions of contraction and dilatation of the heart and arteries, are diſtinguiſhed by the names of *ſyſtole* and *diaſtole*. When the heart is in a ſtate of contraction or ſyſtole, the arteries are at that inſtant diſtended with blood, and in their diaſtole; and it is in this ſtate we feel their pulſatory motion, which we call the *pulſe*. When the heart dilates, and the arteries contract, the blood is impelled onwards into the veins, through which it is returned back to the heart. While the heart, however, is in its ſyſtole, the blood cannot paſs from the veins into the ventricles, but is detained in the auricles, which are two reſervoirs formed for this uſe, till the diaſtole, or dilatation of the heart, takes place; and then the diſtended auricles contract, and drive the blood into the ventricles: ſo that the auricles have an alternate ſyſtole and diaſtole as well as the heart.

Although both the ventricles of the heart contract at the ſame time, yet the blood paſſes from one to the other. In the ſame moment, for inſtance, that the left ventricle drives the blood into the aorta, the right ventricle impels it into the pulmonary artery, which is diſtributed through all the ſubſtance of the lungs. The blood is afterwards brought back into the left ventricle by the pulmonary vein, at the ſame time that the blood is returned by the cavas, into the right ventricle, from all the other parts of the body.

This ſeems to be the mode of action of the heart and its veſſels: but the cauſe of this action has, like all other intricate and intereſting ſubjects, been differently explained. It ſeems to depend on the ſtimulus made on the different parts of the heart by the blood itſelf, which by its quantity and heat, or other properties (d), is perhaps capable of firſt exciting that motion, which is afterwards continued through life, independent of the will, by a regular return of blood to the auricles, in a quantity proportioned to that which is thrown into the arteries.

The heart poſſeſſes the *vis inſita*, or principle of irritability, in a much greater degree than any other muſcle of the body. The pulſe is quicker in young than in old ſubjects, becauſe the former are *cæt. par.* more irritable than the latter. Upon the ſame principle we may explain, why the pulſe is conſtantly quicker in weak than in robuſt perſons.

Sect. XIII. *Of the Circulation.*

125. **After** what has been obſerved of the ſtructure and action of the heart and its auricles, and likewiſe of the arteries and veins, there ſeem to be but very few arguments required to demonſtrate the *circulation of the blood*, which has long ſince been eſtabliſhed as a medical truth. This circulation may be defined to be a perpetual motion of the blood, in conſequence of the action of the heart and arteries, which impel it through all the parts of the body, from whence it is brought back by the veins of the heart.

A very ſatisfactory proof of this circulation, and a proof eaſy to be underſtood, may be deduced from the different effects of preſſure on an artery and a vein. If a ligature, for inſtance, is paſſed round an artery, the veſſel ſwells conſiderably between the ligature and the heart; whereas if we tie up a vein, it only becomes filled between the extremity and the ligature, and this is what we every day obſerve in bleeding. The ligature we paſs round the arm on theſe occaſions, compreſſes the ſuperficial veins; and the return of the blood through them being impeded, they become diſtended. When the ligature is too looſe, the veins are not ſufficiently compreſſed, and the blood continues its progreſs towards the heart; and, on the contrary, when it is made too tight, the arteries themſelves become compreſſed; and the flow of the blood through them being impeded, the veins cannot be diſtended.

Another phænomenon, which effectually proves the circulation, is the loſs of blood that every living animal ſuſtains by opening only a ſingle artery of a moderate ſize; for it continues to flow from the wounded veſſel till the equilibrium is deſtroyed which is eſſential to life. This truth was not unknown to the ancients; and it ſeems ſtrange that it did not lead them to a knowledge of the circulation, as it ſufficiently proves, that all the other veſſels muſt communicate with that which is opened. Galen, who lived more than 1500 years ago, drew this concluſion from it; and if we farther obſerve, that he deſcribes (after Eraſiſtratus, who flouriſhed about 450 years before him) the ſeveral valves of the heart, and determines their diſpoſition and uſes, it will appear wonderful, that a period of near 2000 years ſhould afterwards elapſe before the true courſe of the blood was aſcertained. This diſcovery, for which we are indebted to the immortal Harvey, has thrown new lights on phyſiology and the doctrine of diſeaſes, and conſtitutes one of the moſt important periods of anatomical hiſtory.

Sect. XIV. *Of the Nature of the Blood.*

126. **Blood**, recently drawn from a vein into a baſon, would ſeem to be an homogeneous fluid of a red colour (e); but when ſuffered to reſt, it ſoon coagulates, and divides into two parts, which are diſtinguiſhed by the names of *craſſamentum* and *ſerum*. The craſſamentum is the red coagulum, and the ſerum is the water in which it floats. Each of theſe may be again ſeparated into two others; for the craſſamentum, by being

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(d) Dr Harvey long ago ſuggeſted, that the blood is poſſeſſed of a living principle; and Mr J. Hunter has lately endeavoured to revive this doctrine; in ſupport of which he has adduced many ingenious arguments. The ſubject is a curious one, and deſerves to be proſecuted as an inquiry which cannot but be intereſting to phyſiologiſts.

(e) The blood, as it flows through the arteries, is obſerved to be more florid than it is in the veins; and this redneſs is acquired in its paſſage through the lungs. *Vid.* ſect. vii.

repeatedly waſhed in warm water, gives out all its red globules, and what remains appears to be compoſed of the coagulable lymph (F), which is a gelatinous ſubſtance, capable of being hardened by fire till it becomes perfectly horny: and if we expoſe the ſerum to a certain degree of heat, part of it will be found to coagulate like the white of an egg, and there will remain a clear and limpid water, reſembling urine both in its appearance and ſmell.

The ſerum and craſſamentum differ in their proportion in different conſtitutions; in a ſtrong perſon, the craſſamentum is in a greater proportion to the ſerum than in a weak one;* and the ſame difference is found to take place in diſeaſes (G).

SECT. XV. *Of Nutrition.*

127. THE variety of functions which we have deſcribed as being inceſſantly performed by the living body, and the continual circulation of the blood through it, muſt neceſſarily occaſion a conſtant diſſipation of the ſeveral parts which enter into its compoſition. In ſpeaking of the inſenſible perſpiration, we obſerved how much was inceſſantly paſſing off from the lungs and the ſurface of the ſkin. The diſcharge by urine is likewiſe every day conſiderable; and great part of the bile, ſaliva, &c. are excluded by ſtool. But the ſolid, as well as the fluid parts of the body, require a conſtant renewal of nutritious particles. They are expoſed to the attrition of the fluids which are circulated through them; and the contraction and relaxation they repeat ſo many thouſand times in every day, would neceſſarily occaſion a diſſolution of the machine, if the renewal was not proportioned to the waſte.

It is eaſy to conceive how the chyle formed from the aliment is aſſimilated into the nature of blood, and repairs the loſs of the fluid parts of our body; but how the ſolids are renewed, has never yet been ſatisfactorily explained. The nutritious parts of the blood are probably depoſited by the arteries by exſudation through their pores into the tela celluloſa; and as the ſolid parts of the body are in the embryo only a kind of jelly, which gradually acquires the degree of conſiſtence they are found to have when the body arrives at a more advanced age; and theſe ſame parts which conſiſt of bones, cartilages, ligaments, muſcles, &c. are ſometimes reduced again by diſeaſe to a gelatinous ſtate; we may, with ſome degree of probability, conſider the coagulable lymph as the ſource of nutrition.

If the ſupply of nouriſhment exceeds the degree of waſte, the body increaſes; and this happens in infancy and in youth: for at thoſe periods, but more particularly the former one, the fluids bear a large proportion to the ſolids; and the fibres being ſoft and yielding, are proportionably more capable of extenſion and increaſe. But when the ſupply of nutrition only equals the waſte, we neither increaſe or decreaſe; and we find this to be the caſe when the body has attained its full growth or *acme*: for the ſolids having then acquired a certain degree of firmneſs and rigidity, do not permit a farther increaſe of the body. But as we approach to old age, rigidity begins to be in exceſs, and the fluids (H) bear a much leſs proportion to the ſolids than before. The diſſipation of the body is greater than the ſupply of nouriſhment; many of the ſmaller veſſels become gradually impervious (I); and the fibres loſing their moiſture and their elaſticity, appear flaccid and wrinkled. The lilies and the roſes diſappear, becauſe the fluids by which they were produced can no longer reach the extremities of the capillary veſſels of the ſkin. As theſe changes take place, the nervous power being proportionably weakened, the irritability and ſenſibility of the body, which were formerly ſo remarkable, are greatly diminiſhed; and in advanced life, the hearing, the eye-ſight, and all the other ſenſes, become gradually impaired.

SECT. XVI. *Of the Glands and Secretions.*

128. THE glands are commonly underſtood to be ſmall, roundiſh, or oval bodies formed by the convolution of a great number of veſſels, and deſtined to ſeparate particular humours from the maſs of blood.

They are uſually divided into two claſſes; but it ſeems more proper to diſtinguiſh three kinds of glands, viz. the mucous, conglobate, and conglomerate.

The *mucous glands*, or follicles, as they are moſt commonly called, are ſmall cylindrical tubes continued from the ends of arteries. In ſome parts of the body, as in the tonſils, for example, ſeveral of theſe follicles may be ſeen folded together in one common covering, and opening into one common ſinus. Theſe follicles are the veſſels that ſecrete and pour out mucus in the mouth, œſophagus, ſtomach, inteſtines, and other parts of the body.

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* *Hewſon's Experim. Enq.* Part I.

(F) It may not be improper to obſerve, that till of late the *coagulable lymph* has been confounded with the *ſerum* of the blood, which contains a ſubſtance that is likewiſe coagulable, though only when expoſed to heat, or combined with certain chemical ſubſtances; whereas the other coagulates ſpontaneouſly when expoſed to the air or to reſt.

(G) When the blood ſeparates into *ſerum* and *craſſamentum*, if the latter be covered with a cruſt of a whitiſh or buff colour, it has been uſually conſidered as a certain proof of the blood's being in a ſtate of too great viſcidity. This appearance commonly taking place in inflammatory diſeaſes, has long ſerved to confirm the theory which aſcribes the cauſe of inflammation to lentor and obſtructions. But from the late Mr Hewſon's experiments it appears, that when the action of the arteries is increaſed, the blood, inſtead of being more viſcid, is, on the contrary, more fluid than in the ordinary ſtate, previous to inflammation: and that in conſequence of this, the coagulable lymph ſuffers the red globules, which are the heavieſt part of the blood, to fall down to the bottom before it coagulates: ſo that the craſſamentum is divided into two parts; one of which is found to conſiſt of the coagulable lymph alone (in this caſe termed the *buff*); and the other, partly of this and partly of the red globules.

(H) As the fluids become leſs in proportion to the ſolids, their acrimony is found to increaſe; and this may perhaps compenſate for the want of fluidity in the blood, by diminiſhing its coheſion.

(I) In infancy, the arteries are numerous and large in reſpect to the veins, and the lymphatic glands are larger than at any other time of life; whereas, in old age, the capacity of the venous ſyſtem exceeds that of the arteries, and the lymphatic ſyſtem almoſt diſappears.

The *conglobate glands* are peculiar to the lymphatic ſyſtem. Every lymphatic vein paſſes through a gland of this kind in its way to the thoracic duct. They are met with in different parts of the body, particularly in the axilla, groin, and meſentery, and are either ſolitary or in diſtinct cluſters.

The *conglomerate glands* are of much greater bulk than the conglobate, and ſeem to be an aſſemblage of many ſmaller glands. Of this kind are the liver, kidneys, &c. Some of them, as the pancreas, parotids, &c. have a granulated appearance. All theſe conglomerate glands are plentifully ſupplied with blood-veſſels; but their nerves are in general very minute, and few in number. Each little granulated portion furniſhes a ſmall tube, which unites with other ſimilar ducts, to form the common excretory duct of the gland.

The principal glands, and the humours they ſecrete, have been already deſcribed in different parts of this work; and there only remains for us to examine the general ſtructure of the glands, and to explain the mechaniſm of ſecretion. On the firſt of theſe ſubjects two different ſyſtems have been formed; each of which has had, and ſtill continues to have, its adherents. One of theſe ſyſtems was advanced by Malpighi, who ſuppoſed that an artery entering into a gland ramifies very minutely through its whole ſubſtance; and that its branches ultimately terminate in a veſicular cavity or follicle, from whence the ſecreted fluid paſſes out through the excretory duct. This doctrine at firſt met with few opponents; but the celebrated Ruyſch, who firſt attempted minute injections with wax, afterwards diſputed the exiſtence of theſe follicles, and aſſerted, that every gland appears to be a continued ſeries of veſſels, which after being repeatedly convoluted in their courſe through its ſubſtance, at length terminate in the excretory duct. Anatomiſts are ſtill divided between theſe two ſyſtems: that of Malpighi, however, ſeems to be the beſt founded.

The mode of ſecretion has been explained in a variety of ways, and they are all perfectly hypothetical. In ſuch an inquiry it is natural to aſk, how one gland conſtantly ſeparates a particular humour, while another gland ſecretes one of a very different nature from the blood? The bile, for inſtance, is ſeparated by the liver, and the urine by the kidneys. Are theſe ſecretions to be imputed to any particular diſpoſitions in the fluids, or is their cauſe to be looked for in the ſolids?

It has been ſuppoſed, that every gland contains within itſelf a fermenting principle, by which it is enabled to change the nature of the blood it receives, and to endue it with a particular property. So that, according to this ſyſtem, the blood, as it circulates through the kidneys, becomes mixed with the fermenting principle of thoſe glands, and a part of it is converted into urine; and again, in the liver, in the ſalival and other glands, the bile, the ſaliva, and other juices, are generated from a ſimilar cauſe. But it ſeems to be impoſſible for any liquor to be confined in a place expoſed to the circulation, without being carried away by the torrent of blood, every part of which would be equally affected; and this ſyſtem of fermentation has long been rejected as vague and chimerical. But as the cauſe of ſecretion continued to be looked for in the fluids, the former ſyſtem was ſucceeded by another, in which recourſe was had to the analogy of the humours. It was obſerved, that if paper is moiſtened with water, and oil and water are afterwards poured upon it, that the water only will be permitted to paſs through it; but that, on the other hand, if the paper has been previouſly ſoaked in oil inſtead of water, the oil only, and not the water, will be filtered through it. Theſe obſervations led to a ſuppoſition, that every ſecretory organ is originally furniſhed with a humour analogous to that which it is afterwards deſtined to ſeparate from the blood; and that in conſequence of this diſpoſition, the ſecretory veſſels of the liver, for inſtance, will only admit the bilous particles of the blood, while all the other humours will be excluded. This ſyſtem is an ingenious one, but the difficulties with which it abounds are unanſwerable; for oil and water are immiſcible; whereas the blood, as it is circulated through the body, appears to be an homogeneous fluid. Every oil will paſs through a paper moiſtened only with one kind of oil; and wine, or ſpirits mixed with water, will eaſily be filtered through a paper previouſly ſoaked in water. Upon the ſame principle, all our humours, though differing in their other properties, yet agreeing in that of being perfectly miſcible with each other, will all eaſily paſs through the ſame filtre.—But theſe are not all the objections to this ſyſtem. The humours which are ſuppoſed to be placed in the ſecretory veſſels for the determination of ſimilar particles of the blood, muſt be originally ſeparated without any analogous fluid; and that which happens once, may as eaſily happen always. Again, it ſometimes happens from a vicious diſpoſition, that humours are filtered through glands which are naturally not intended to afford them a paſſage; and when this once has happened, it ought, according to this ſyſtem, to be expected always to do ſo: whereas this is not the caſe; and we are, after all, naturally led to ſeek for the cauſe of ſecretions in the ſolids. It does not ſeem right to aſcribe it to any particular figure of the ſecretory veſſels; becauſe the ſoft texture of thoſe parts does not permit them to preſerve any conſtant ſhape, and our fluids ſeem to be capable of accommodating themſelves to every kind of figure. Some have imputed it to the difference of diameter in the orifices of the different ſecretory veſſels. To this doctrine objections have likewiſe been raiſed; and it has been argued, that the veſſels of the liver, for inſtance, would, upon this principle, afford a paſſage not only to the bile, but to all the other humours of leſs conſiſtence with it. In reply to this objection, it has been ſuppoſed, that ſecondary veſſels exiſt, which originate from the firſt, and permit all the humours thinner than the bile to paſs through them.

Each of theſe hypotheſes is probably very remote from the truth.

EXPLANATION of PLATE XXVIII.

This plate repreſents the Heart in ſitu, all the large Arteries and Veins, with ſome of the Muſcles, &c.

Muscles, &c.—Superior Extremity.—a, Maſſeter. b, Complexus. C, Digaſtricus. d, Os hyoides. e, Thyroid gland. f, Levator ſcapulæ. g, Cucullaris. h h, The clavicles cut. i, The deltoid muſcle. k, Biceps flexor cubiti cut. l, Caraco-brachialis. m, Triceps extenſor cubiti. n, The heads of the pronator teres, flexor carpi radiales, and flexor digitorum ſublimis, cut. o, The flexor carpi ulnaris, cut at its extremity. p, Flexor digitorum profundus. q, Supinator radii longus, cut at its extremity. r, Ligamentum carpi tranſverſale. s, Extenſores carpi radiales. t, Latiſſimus dorſi. u, Anterior edge of the ſerratus anticus major. v v, The inferior part of the diaphragm. w w, Its anterior edge cut. x x, The kidneys. y, Tranſverſus abdominis. z, Os ilium.

Inferior Extremity.—*a*, Pſoas magnus. *b*, Iliacus internus. *c*, The fleſhy origin of the tenſor vagina femoris. *d d*, The oſſa pubis cut from each other. *e*, Muſculus pectineus cut from its origin. *f*, Short head of the triceps abductor femoris cut. *g*, The great head of the triceps. *h*, The long head cut. *i*, Vaſtus internus. *k*, Vaſtus externus. *l*, Crureus. *m*, Gemellus. *n*, Soleus. *o*, Tibia. *p*, Peronæus longus. *q*, Peronæus brevis. *r*, Fibula.

Heart and Blood-vessels.—A, The heart, with the coronary arteries and veins. B, The right auricle of the heart. C, The aorta aſcendens. D, The left ſubclavian artery. E, The left carotid artery. F, The common trunk which ſends off the right ſubclavian and right carotid arteries. G, The carotis externa. H, Arteria facialis, which ſends off the coronary arteries of the lips. I, Arteria temporalis profunda. K, Aorta deſcendens. L L, The iliac arteries,—which ſend off M M, The femoral or crural arteries. *N. B.* The other arteries in this figure have the ſame diſtribution as the veins of the ſame name:—And generally, in the anatomical plates, the deſcription to be found on the one ſide, points out the ſame parts in the other. 1, The frontal vein. 2, The facial vein. 3, Vena temporalis profunda. 4, Vena occipitalis. 5, Vena jugularis externa. 6, Vena jugularis interna, covering the arteria carotis communis. 7, The vaſcular arch on the palm of the hand, which is formed by, 8, The radial artery and vein, and, 9, The ulnar artery and vein. 10 10, Cephalic vein. 11, Baſilic vein, that on the right ſide cut. 12, Median vein. 13, The humeral vein, which, with the median, covers the humeral artery. 14 14, The external thoracic or mammary arteries and veins. 15, The axillary vein, covering the artery. 16 16, The ſubclavian veins, which, with (6 6) the jugulars, form, 17, The vena cava ſuperior. 18, The cutaneous arch of veins on the fore part of the foot. 19, The vena tibialis antica, covering the artery. 20, The vena profunda femoris, covering the artery. 21, The upper part of the vena ſaphena major. 22, The femoral vein. 23 23, The iliac veins. 24 24, Vena cava inferior. 25 25, The renal veins covering the arteries. 26 26, The diaphragmatic veins.

Part V. Of the BRAIN and NERVES.

Sect. I. *Of the Brain and its Integuments.*

129. The bones of the cranium were deſcribed in the oſteological part of this work, as incloſing the brain, and defending it from external injury: but they are not its only protection; for when we make an horizontal

130 Integuments of the brain. ſection through theſe bones, we find this maſs everywhere ſurrounded by two membranes (k), the dura and pia mater.—The firſt of theſe lines the interior ſurface of the cranium, to which it everywhere adheres ſtrongly (l), but more particularly at the ſutures, and at the many foramina through which veſſels paſs between it and the pericranium. The *dura mater* (m) is perfectly ſmooth and inelaſtic, and its inner ſurface is conſtantly bedewed with a fine pellucid fluid, which everywhere ſeparates it from the pia mater. The dura mater ſends off ſeveral conſiderable proceſſes, which divide the brain into ſeparate portions, and prevent them from compreſſing each other. Of theſe proceſſes there is one ſuperior and longitudinal, called the *falx*, or *falciform proceſs*, from its reſemblance to a ſcythe. It ariſes from the ſpine of the os frontis, near the chriſta galli, and extending along in the direction of the ſagittal ſuture, to beyond the lambdoidal ſuture, divides the brain into two hemiſ-

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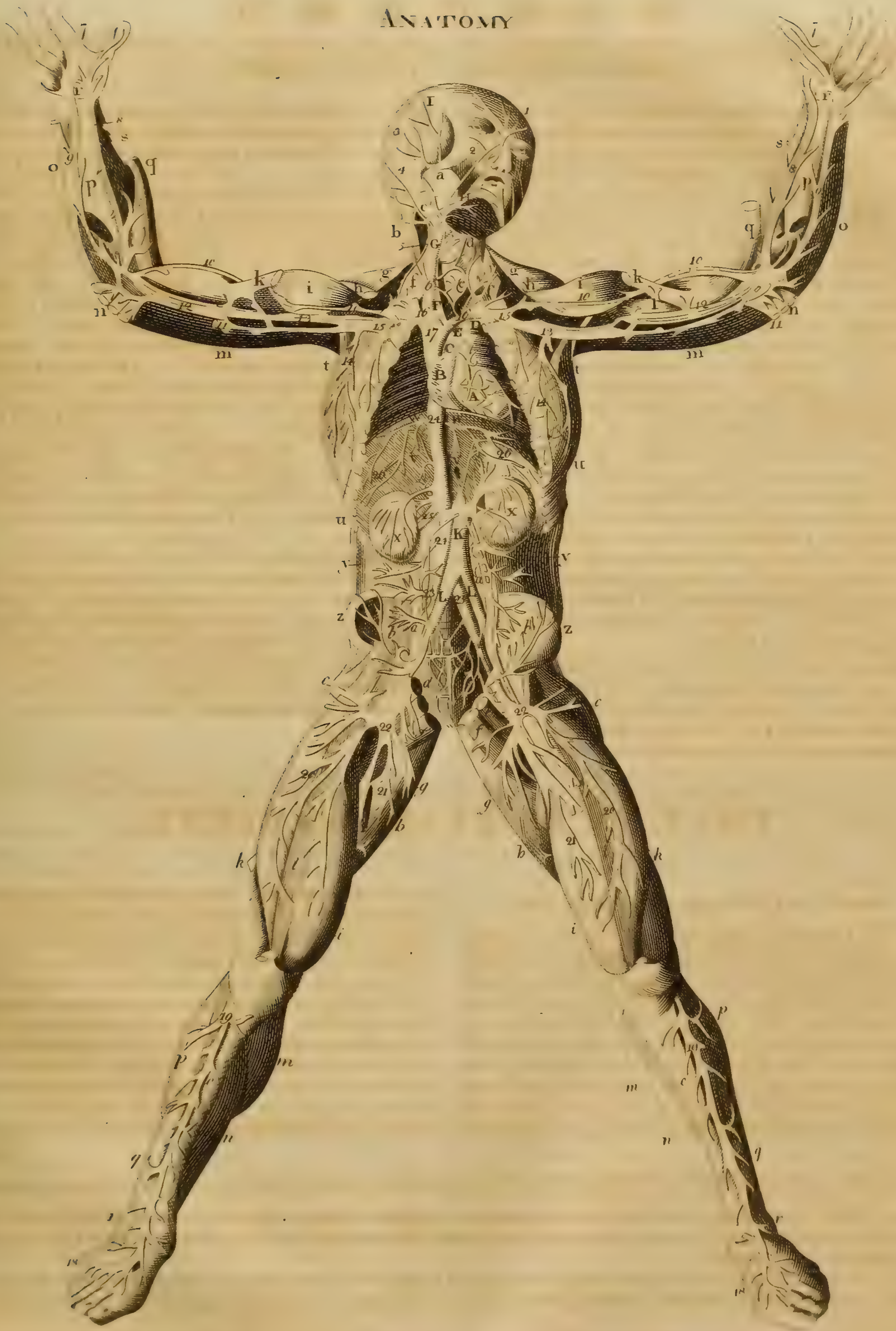
(k) The Greeks called theſe membranes *meninges*; but the Arabians, ſuppoſing them to be the ſource of all the other membranes of the body, afterwards gave them the names of *dura* and *pia mater*; by which they are now uſually diſtinguiſhed.

(l) In young ſubjects this adheſion is greater than in adults; but even then, in the healthy ſubject, it is no where eaſily ſeparable, without breaking through ſome of the minute veſſels by means of which it is attached to the bone.

(m) This membrane is commonly deſcribed as conſiſting of two laminæ; of which the external one is ſuppoſed to perform the office of perioſteum internum to the cranium, while the internal one forms the folds and proceſſes of the dura mater. In the natural ſtate, however, no ſuch ſeparation is apparent; like other membranes, we may indeed divide it, not into two only, but many laminæ; but this diviſion is artificial, and depends on the dexterity of the anatomiſt.

ANATOMY



Jas. Parker sc.

hemiſpheres. A little below the lambdoidal ſuture, it divides into two broad wings or expanſions called the *tranſverſe* or *lateral proceſſes*, which prevents the lobes of the cerebrum from preſſing on the cerebellum. Beſides theſe there is a fourth, which is ſituated under the tranſverſe proceſſes, and being continued to the ſpine of the occiput, divides the cerebellum into two lobes.

The blood, after being diſtributed through the cavity of the cranium by means of the arteries, is returned, as in the other parts of the body, by veins which all paſs on to certain channels, ſituated behind theſe ſeveral proceſſes.

Theſe canals or ſinuſes communicate with each other, and empty themſelves into the internal jugular veins, which convey the blood into the vena cava. They are in fact triangular veins, running through the ſubſtance of the dura mater, and, like the proceſſes, are diſtinguiſhed into *longitudinal* and *lateral*; and where theſe three meet, and where the fourth proceſs paſſes off, we obſerve a fourth ſinus, which is called *torcular*; Herophilus, who firſt deſcribed it, having ſuppoſed that the blood at the union of theſe two veins, is, as it were, in a preſs.

Beſides theſe four canals, which were known to the ancients, modern anatomiſts enumerate many others, by giving the appellation of *ſinuſes* to other veins of the dura mater, which for the moſt part empty themſelves into ſome of thoſe we have juſt now deſcribed. There are the inferior longitudinal ſinus, the ſuperior and inferior petrous ſinuſes, the cavernous ſinuſes, the circular ſinus, and the anterior and poſterior occipital ſinuſes.

Theſe ſinuſes or veins, by being conveyed through a thick denſe membrane, firmly ſuſpended, as the dura mater is, within the cranium, are leſs liable to rupture; at the ſame time they are well ſupported, and by running every where along the inner ſurface of the bones, they are prevented from preſſing on the ſubſtance of the brain. To prevent too great a dilatation of them, we find filaments (called *chordæ Williſii*, from their having been firſt noticed by Willis) ſtretched acroſs their cavities; and the oblique manner in which the veins from the brain run through the ſubſtance of the brain into theſe channels, ſerves the purpoſe of a valve, which prevents the blood from turning back into the ſmaller and weaker veſſels of the brain.

The *pia mater* is a much ſofter and finer membrane than the dura mater; being exceedingly delicate, tranſparent, and vaſcular. It inveſts every part of the brain, and ſends off an infinite number of elongations, which inſinuate themſelves between the convolutions, and even into the ſubſtance of the brain. This membrane is compoſed of two laminæ; of which the exterior one is named *tunica arachnoidea*, from its thinneſs, which is equal to that of a ſpider's web. Theſe two laminæ are intimately adherent to each other at the upper part of the brain, but are eaſily ſeparable at the baſis of the brain, and through the whole length of the medulla ſpinalis. The external layer, or tunica arachnoidea, appears to be ſpread uniformly over the ſurface of the brain, but without entering into its furrows as the inner layer does; the latter being found to inſinuate itſelf between the convolutions, and even into the interior cavities of the brain. The blood-veſſels of the brain are diſtributed through it in their way to that organ, and are therefore divided into very minute ramifications, before they penetrate the ſubſtance of the brain.

131
The brain.

There are ſeveral parts included under the general denomination of *brain*. One of theſe, which is of the ſofteſt conſiſtence, and fills the greateſt part of the cavity of the cranium, is the *cerebrum*, or *brain* properly ſo called. Another portion, which is ſeated in the inferior and poſterior part of the head, is the *cerebellum*; and a third, which derives its origin from both theſe, is the *medulla oblongata*.

132
Cerebrum.

The *cerebrum* is a medullary maſs of a moderate conſiſtence, filling up exactly all the upper part of the cavity of the cranium, and divided into two hemiſpheres by the falx of the dura mater. Each of theſe hemiſpheres is uſually diſtinguiſhed into *an interior, a middle*, and *a poſterior lobe*. The firſt of theſe is lodged on the orbital proceſſes of the os frontis; the middle lobes lie on the middle foſſæ of the baſis of the cranium, and the poſterior lobes are placed on the tranſverſe ſeptum of the os occipitis, immediately over the cerebellum, from which they are ſeparated by the lateral proceſſes of the dura mater. Theſe two portions afford no diſtinguiſhing mark of ſeparation; and on this account Haller, and many other modern anatomiſts, omit the diſtinction of middle lobe, and ſpeak only of the anterior and poſterior lobes of the brain.

The cerebrum appears to be compoſed of two diſtinct ſubſtances. Of theſe, the exterior one, which is of a greyiſh or aſh-colour, is called the *cortex*, and is ſomewhat ſofter than the other, which is very white, and is called *medulla* or *ſubſtantia alba*.

After having removed the falx, and ſeparated the two hemiſpheres from each other, we perceive a white convex body, the corpus calloſum, which is a portion of the medullary ſubſtance, uniting the two hemiſpheres to each other, and not inveſted by the cortex. By making an horizontal inciſion in the brain, on a level with this corpus calloſum, we diſcover two oblong cavities, named the *anterior* or *lateral ventricles*, one in each hemiſphere. Theſe two ventricles, which communicate with each other by a hole immediately under the plexus choroides, are ſeparated laterally by a very fine medullary partition, called *ſeptum lucidum*, from its thinneſs and tranſparency. The lower edge of this ſeptum is fixed to the fornix, which is a kind of medullary arch (as its name implies) ſituated under the corpus calloſum, and nearly of a triangular ſhape. Anteriorly the fornix ſends off two medullary chords, called its *anterior crura*; which ſeem to be united to each other by a portion of medullary ſubſtance, named *commiſſura anterior cerebri*. Theſe crura diverging from one another, are loſt at the outer ſide of the lower and fore-part of the third ventricle. Poſteriorly the fornix is formed into two other crura, which unite with two medullary protuberances called *pedes hippocampi*, and ſometimes *cornua ammonis*, that extend along the back-part of the lateral ventricles. The concave edge of the pedes hippocampi is covered by a medullary lamina, called *corpus fimbriatum*.

Neither the edges of the fornix, nor its poſterior crura, can be well diſtinguiſhed, till we have removed the plexus choroides. This is a production of the pia mater, which is ſpread over the lateral ventricles. Its looſe edges are collected, ſo as to appear like a vaſcular band on each ſide.

When we have removed this plexus, we diſcover ſeveral other protuberances included in the lateral ventricles. Theſe are the corpora ſtriata, the thalami nervorum opticorum, the tubercula quadrumgemina, and the pineal gland.

The *corpora ſtriata* are two curved oblong eminences, that extend along the anterior part of the lateral ventricles. They derive their name from their ſtriated appearance, which is owing to an intermixture of the cortical and medullary ſubſtances of the brain. The *thalami nervorum opticorum*, are ſo called, becauſe the optic nerves ariſe chiefly from them, and they are likewiſe compoſed both of the cortex and medulla. They are ſeparated from the corpora ſtriata only by a kind of medullary chord, the geminum centrum ſemi-circulare. The thalami are nearly of an oval ſhape, and are ſituated at the bottom of the upper cavity of the lateral ventricles. They are cloſely united, and at their convex part ſeem to become one body.

Anteriorly, in the ſpace between the thalami, we obſerve an orifice by which the lateral ventricles communicate, and another leads down from this, under the different appellations of *foramen commune anterius, vulva iter ad infundibulum*, but more properly *iter ad tertium ventriculum;* and the ſeparation of the thalami from each other poſteriorly, forms another opening or interſtice called *anus*. This has been ſuppoſed to communicate with the third ventricle; but it does not, the bottom of it being ſhut up by the pia mater. The back part of the anus is formed by a kind of medullary band, which connects the thalami to each other, and is called *commiſſura poſterior cerebri*.

Behind the thalami and commiſſura poſterior, we obſerve a ſmall, ſoft, greyiſh, and oval body, about the ſize of a pea. This is the glandula pinealis; it is deſcribed by Galen under the name of *conarion*, and has been rendered famous by Deſcartes, who ſuppoſed it to be the ſeat of the ſoul. Galen ſeems formerly to have entertained the ſame opinion. Some modern writers have, with as little reaſon, imagined that the ſoul is placed in the corpus calloſum.

The pineal gland reſts upon four remarkable eminences, diſpoſed in pairs, and ſeated immediately below it. Theſe tubercles, which by the ancients were called *teſtes* and *nates*, have, ſince the time of Winſlow, been more commonly named *tubercula quadrugemina*.

Under the thalami we obſerve another cavity, the third ventricle, which terminates anteriorly in a ſmall medullary canal, the infundibulum, that leads to the glandula pituitaria. It has been doubted, whether the infundibulum is really hollow; but ſome late experiments on this part of the brain * by Profeſſor Murray of Upſal, clearly prove it to be a medullary canal, ſurrounded by both laminæ of the pia mater. After freezing the brain, this channel was found filled with ice; and de Haen tells † us, he found it dilated, and filled with a calcareous matter (n).

* *Diſp. de Infundibulo Cerebri.*

† *Ratio Med.* tom. vi. p. 271.

The ſoft ſpongy body in which the infundibulum terminates, was by the ancients ſuppoſed to be of a glandular ſtructure, and deſtined to filter the ſeroſity of the brain. Spigelius pretended to have diſcovered its excretory duct, but it ſeems certain that no ſuch duct exiſts. It is of an oblong ſhape, compoſed, as it were, of two lobes. In ruminant animals it is much larger than in man.

From the poſterior part of the third ventricle, we ſee a ſmall groove or channel, deſcending obliquely backwards. This channel, which is called the *aqueduct of Sylvius*, though it was known to the ancients, opens into another cavity of the brain, placed between the cerebellum and medulla oblongata, and called the *fourth ventricle*.

133 Cerebellum.

The *cerebellum*, which is divided into two lobes, is commonly ſuppoſed to be of a firmer texture than the cerebrum; but the truth is, that in the greater number of ſubjects, there appears to be no ſenſible difference in the conſiſtence of theſe two parts. It has more of the cortical than of the medullary ſubſtance in its compoſition.

The furrow that divides the two lobes of the cerebellum leads anteriorly to a proceſs, compoſed of medullary and cortical ſubſtances, covered by the pia mater; and which, from its being divided into numerous furrows, reſembling the rings of the earth-worm, is named *proceſſus vermiformis*. This proceſs forms a kind of ring in its courſe between the lobes.

The ſurface of the cerebellum does not afford thoſe circumvolutions which appear in the cerebrum; but inſtead of theſe, we obſerve a great number of minute furrows, running parallel to each other, and nearly in a tranſverſe direction. The pia mater inſinuates itſelf into theſe furrows.

When we cut into the ſubſtance of the cerebellum, from above downwards, we find the medullary part running in a kind of ramifying courſe, and exhibiting an appearance that has gotten the name of *arbor vitæ*. Theſe ramifications unite to form a medullary trunk; the middle, anterior, and moſt conſiderable part of which forms two proceſſes, the crura cerebelli, which unite with the crura cerebri, to form the medulla oblongata. The laſt furniſhes two other proceſſes, which loſe themſelves under the nates, and thus unite the lobes of the cerebellum to the poſterior part of the cerebrum. Under the nates we obſerve a tranſverſe medullary line, or linea alba, running from one of theſe proceſſes to the other; and between them we find a very thin medullary lamina, covered with the pia mater, which the generality of anatomiſts have (though ſeemingly without reaſon) conſidered as a valve formed for cloſing the communication between the fourth ventricle and the aquæductus Sylvii. Vieuſſens named it *valvula major cerebri*.

134 Medulla oblongata.

The *medulla oblongata* is ſituated in the middle, lower, and poſterior part of the cranium, and may be conſidered as a production or continuation of the whole medullary ſubſtance of the cerebrum and cerebellum, being formed by the union of two conſiderable medullary proceſſes of the cerebrum, called *crura cerebri*,

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(n) The under part of it, however, appears to be impervious; at leaſt no injection that can be depended on has been made to paſs from it into the glandula pituitaria without laceration of parts.

Of the Brain and Nerves.

bri, with two other ſmaller ones from the cerebellum, which were juſt now ſpoken of under the name of *crura cerebelli*.

The crura cerebri ariſe from the middle and lower part of each hemiſphere. They are ſeparated from each other at their origin, but are united below, where they terminate in a middle protuberance, the *pons Varolii*, ſo called, becauſe Varolius compared it to a bridge. This name, however, can convey no idea of its real appearance. It is, in fact, nothing more than a medullary protuberance, nearly of a ſemi-ſpherical ſhape, which unites the crura cerebri to thoſe of the cerebellum.

Between the crura cerebri, and near the anterior edge of the pons Varolii, are two tubercles, compoſed externally of medullary, and internally of cineritious, ſubſtance, to which Euſtachius firſt gave the name of *eminentiæ mamillares*.

Along the middle of the poſterior ſurface of the medulla oblongata, where it forms the anterior part of the fourth ventricle, we obſerve a kind of furrow which runs downwards and terminates in a point. About an inch above the lower extremity of this fiſſure, ſeveral medullary filaments are to be ſeen running towards it on each ſide in an oblique direction, ſo as to give it the appearance of a writing-pen; hence it is called *calamus ſcriptorius*.

From the poſterior part of the pons Varolii, the medulla oblongata deſcends obliquely backwards; at its fore-part, immediately behind the pons Varolii, we obſerve two pair of eminences, which were deſcribed by Euſtachius, but received no particular appellation till the time of Vieuſſens, who gave them the names of *corpora olivaria* and *corpora pyramidalia*. The former are the outermoſt, being placed one on each ſide. They are nearly of an oval ſhape, and are compoſed of medulla, with ſtreaks of cortical ſubſtance. Between theſe are the corpora pyramidalia, each of which terminates in a point. In the human ſubject theſe four eminences are ſometimes not eaſily diſtinguiſhed

135 Medulla ſpinalis.

The *medulla ſpinalis*, or *ſpinal marrow*, which is the name given to the medullary chord that is extended down the vertebral canal, from the great foramen of the occipital bone to the bottom of the laſt lumbar vertebra, is a continuation of the medulla oblongata. Like the other parts of the brain, it is inveſted by the dura and pia mater. The firſt of theſe, in its paſſage out of the cranium, adheres to the foramen of the os occipitis. Its connection with the ligamentary ſubſtance that lines the cavity of the ſpine, is only by means of cellular membrane; but between the ſeveral vertebræ, where the nerves paſs out of the ſpine, it ſends off prolongations, which adhere ſtrongly to the vertebral ligaments. Here, as in the cranium, the dura mater has its ſinuſes or large veins. Theſe are two in number, and are ſeen running on each ſide of the medullary column, from the foramen magnum of the os occipitis to the lower part of the os ſacrum. They communicate together by ramifying branches at each vertebra, and terminate in the vertebral, intercoſtal, and ſacral veins.

The pia mater is connected with the dura mater by means of a thin tranſparent ſubſtance, which from its indentations between the ſpinal nerves has obtained the name of *ligamentum denticulatum*. It is ſomewhat firmer than the tunica arochnoidea, but in other reſpects reſembles that membrane. Its uſe is to ſupport the ſpinal marrow, that it may not affect the medulla oblongata by its weight.

The ſpinal marrow itſelf is externally of a white colour; but upon cutting into it we find its middle-part compoſed of a darker coloured maſs, reſembling the cortex of the brain. When the marrow has reached the firſt lumbar vertebra, it becomes extremely narrow, and at length terminates in an oblong protuberance; from the extremity of which the pia mater ſends off a prolongation or ligament, reſembling a nerve, that perforates the dura mater, and is fixed to the os coccygis.

The medulla ſpinalis gives riſe to 30 or 31 pair of nerves, but they are not all of the ſame ſize, nor do they all run in the ſame direction. The upper ones are thinner than the reſt, and are placed almoſt tranſverſely: as we deſcend we find them running more and more obliquely downwards, till at length their courſe is almoſt perpendicular, ſo that the lowermoſt nerves exhibit an appearance that is called *cauda equina*, from its reſemblance to a horſe's tail.

The arteries that ramify through the different parts of the brain, are derived from the internal carotid and from the vertebral arteries. The medulla ſpinalis is ſupplied by the anterior and poſterior ſpinal arteries, and likewiſe receives branches, from the cervical, the inferior and ſuperior intercoſtal, the lumbar, and the ſacral arteries.

SECT. II. *Of the Nerves.*

136.

THE nerves are medullary chords, differing from each other in ſize, colour, and conſiſtence, and deriving their origin from the medulla oblongata and medulla ſpinalis. There are 39, and ſometimes 40, pair of theſe nerves; nine (o) of which originate from the medulla oblongata, and 30 or 31 from the medulla ſpinalis. They appear to be perfectly inelaſtic, and likewiſe to poſſeſs no irritability. If we irritate muſcular fibres, they immediately contract; but nothing of this ſort happens if we irritate a nerve. They carry with them a covering from the pia mater; but derive no tunic from the dura mater, as hath been generally, though erroneouſly, ſuppoſed, ever ſince the time of Galen (p), the outer covering of the nerves being in fact nothing more than the cellular membrane. This covering is very thick where the nerve is expoſed to the action of muſcles; but where it runs through a bony canal, or is ſecure from preſſure, the cellular tunic is extremely thin, or altogether wanting. We have inſtances of this in the portio mollis of the auditory nerve, and in the nerves of the heart.

(o) It has been uſual to deſcribe the ten pair of nerves as ariſing from the medulla oblongata; but as the tenth pair ariſe in the ſame manner as the other ſpinal nerves, Santorini, Heiſter, Haller, and others, ſeem very properly to have claſſed them among the nerves of the ſpine.

(p) Baron Haller and Profeſſor Zinn ſeem to have been the firſt who demonſtrated, that the dura mater is reflected upon and adheres to the perioſteum at the edges of the foramina that afford a paſſage to the nerves out of the cranium, and vertebral canal, or is ſoon loſt in the cellular ſubſtance.

By elevating, carefully and gently, the brain from the baſis of the cranium, we find the firſt nine pair ariſing in the following order: 1. The nervi olfactorii, diſtributed through the pituitary membrane, which conſtitutes the organ of ſmell. 2. The optici, which go to the eyes, where they receive the impreſſions of viſible objects. 3. The oculorum motores, ſo called becauſe they are diſtributed to the muſcles of the eye. 4. The pathetici, diſtributed to the ſuperior oblique muſcles of the eyes, the motion of which is expreſſive of certain paſſions of the ſoul. 5. The nerves of this pair ſoon divide into three principal branches, and each of theſe has a different name. Its upper diviſion is the ophthalamicus, which is diſtributed to various parts of the eyes, eye-lids, forehead, noſe, and integuments of the face. The ſecond is called the *maxillaris ſuperior*, and the third *maxillaris inferior*; both which names allude to their diſtribution. 6. The abductores; each of theſe nerves is diſtributed to the abductor muſcle of the eye, ſo called, becauſe it helps to draw the globe of the eye from the noſe. 7. The auditorii (q), which are diſtributed through the organs of hearing. 8. The par vagum, which derives its name from the great number of parts to which it gives branches both in the thorax and abdomen. 9. The linguales, or hypo-gloſſi, which are diſtributed to the tongue, and appear to contribute both to the organ of taſte and to the motions of the tongue (r).

It has already been obſerved, that the ſpinal marrow ſends off 30 or 31 pair of nerves; theſe are chiefly diſtributed to the exterior parts of the trunk and to the extremities. They are commonly diſtinguiſhed into the *cervical, dorſal, lumbar,* and *ſacral nerves.* The cervical, which paſs out from between the ſeveral vertebræ of the neck, are eight (s) in number; the dorſal, twelve; the lumbar, five; and the ſacral, five or ſix; the number of the latter depending on the number of holes in the os ſacrum. Each ſpinal nerve at its origin is compoſed of two faſciculi of medullary fibres. One of theſe faſciculi ariſes from the anterior, and the other from the poſterior, ſurface of the medulla. Theſe faſciculi are ſeparated by the ligamentum denticulatum; after which we find them contiguous to one another. They then perforate the dura mater, and unite to form a conſiderable knot or ganglion. Each of theſe ganglions ſends off two branches; one anterior, and the other poſterior. The anterior branches communicate with each other at their coming out of the ſpine, and likewiſe ſend off one, and ſometimes more branches, to aſſiſt in the formation of the intercoſtal nerve.

The knots or ganglions of the nerves juſt now ſpoken of, are not only to be met with at their exit from the ſpine, but likewiſe in various parts of the body. They occur in the nerves of the medulla oblongata, as well as in thoſe of the ſpine. They are not the effects of diſeaſe, but are to be met with in the ſame parts of the ſame nerves, both in the fœtus and adult. They are commonly of an oblong ſhape, and of a greyiſh colour, ſomewhat inclined to red, which is perhaps owing to their being extremely vaſcular. Internally we are able to diſtinguiſh ſomething like an intermixture of the nervous filaments.

Some writers have conſidered them as ſo many little brains; Lanciſi fancied he had diſcovered muſcular fibres in them, but they are certainly not of an irritable nature. A late writer, Dr Johnſtone[*], imagines they are intended to deprive us of the power of the will over certain parts, as the heart, for inſtance: but if this hypotheſis were well founded, we ſhould meet with them only in the nerves leading to involuntary muſcles; whereas it is certain, that the voluntary muſcles receive their nerves through ganglions. Doctor Monro, from obſerving the accurate intermixture of the minute nerves which compoſe them, conſiders them as new ſources of nervous energy[†].

The nerves, like the blood-veſſels, in their courſe through the body, communicate with each other; and each of theſe communications conſtitutes what is called a *plexus*, from whence branches are again detached to different parts of the body. Some of theſe are conſtant

[*] *Eſſay on the Uſe of the Ganglions of the Nerves.*

[†] *Obſervations on the Nervous Syſtem.*

(q) This pair, ſoon after its entrance into the meatus auditorius internus, ſeparates into two branches. One of theſe is of a very ſoft and pulpy conſiſtence, it is called the *portio mollis* of the ſeventh pair, and is ſpread over the inner part of the ear. The other paſſes out through the aqueduct of Fallopius in a firm chord, which is diſtinguiſhed as the portio dura, and is diſtributed to the external ear and other parts of the neck and face.

(r) Heiſter has ſummed up the uſes of theſe nine pair of nerves in the two following Latin verſes:

“ *Olfaciens, cernens, oculoſque movens, patienſque,*
“ *Guſtans, abducens, audienſque, vaganſque, loquenſque.*”

(s) Beſides theſe, there is another pair called *acceſſorii*, which ariſes from the medulla ſpinalis at its beginning; and aſcending through the great foramen of the os occipitis into the cranium, paſſes out again cloſe to the eighth pair, with which, however, it does not unite; and it is afterwards diſtributed chiefly to the muſcles of the neck, back, and ſcapula. In this courſe it ſends off filaments to different parts, and likewiſe communicates with ſeveral other nerves. Phyſiologiſts are at a loſs how to account for the ſingular origin and courſe of theſe nervi acceſſorii. The ancients conſidered them as branches of the eighth pair, diſtributed to muſcles of the ſcapula: Willis likewiſe conſidered them as appendages to that pair, and on that account named them *acceſſorii*. They are ſometimes called the *ſpinal* pair; but as this latter name is applicable to all the nerves of the ſpine indiſcriminately, it ſeems better to adopt that given by Willis.

ſtant and conſiderable enough to be diſtinguiſhed by particular names, as the *ſemilunar plexus;* the *pulmonary plexus;* the *hepatic,* the *cardiac,* &c.

It would be foreign to the purpoſe of this work, to follow the nerves through all their diſtributions; but it may be remembered, that in deſcribing the different viſcera, mention was made of the nerves diſtributed to them. There is one pair, however, called the *intercoſtal,* or *great ſympathetic nerve,* which ſeems to require particular notice, becauſe it has an almoſt univerſal connection and correſpondence with all the other nerves of the body. Authors are not perfectly agreed about the origin of the intercoſtal; but it may perhaps not improperly be deſcribed, as beginning from filaments of the fifth and ſixth pair; it then paſſes out of the cranium, through the bony canal of the carotid, from whence it deſcends laterally cloſe to the bodies of the vertebræ, and receives branches from almoſt all the vertebral nerves; forming almoſt as many ganglions in its courſe through the thorax and abdomen. It ſends off an infinite number of branches to the viſcera in thoſe cavities, and forms ſeveral plexuſes with the branches of the eighth pair or par vagum.

That the nerves are deſtined to convey the principles of motion and ſenſibility to the brain from all parts of the ſyſtem, there can be no doubt; but how theſe effects are produced, no one has ever yet been able to determine. The inquiry has been a conſtant ſource of hypotheſis in all ages, and has produced ſome ingenious ideas, and many erroneous poſitions, but without having hitherto afforded much ſatisfactory information.

Some phyſiologiſts have conſidered a trunk of nerves as a ſolid chord, capable of being divided into an infinite number of filaments, by means of which the impreſſions of feeling are conveyed to the ſenſorium commune. Others have ſuppoſed it to be a canal, which afterwards ſeparates into more minute channels; or, perhaps, as being an aſſemblage of many very ſmall and diſtinct tubes, connected to each other, and thus forming a cylindrical chord. They who contend for their being ſolid bodies, are of opinion, that feeling is occaſioned by vibration; ſo that, for inſtance, according to this ſyſtem, by pricking the finger, a vibration would be occaſioned in the nerve, diſtributed through its ſubſtance; and the effects of this vibration, when extended to the ſenſorium, would be an excital of pain. But the inelaſticity, the ſoftneſs, the connection, and the ſituation of the nerves, are ſo many proofs that vibration has no ſhare in the cauſe of feeling.

Others have ſuppoſed, that in the brain and ſpinal marrow, a very ſubtile fluid is ſecreted, and from thence conveyed through the imperceptible tubes, which they conſider as exiſting in the nerves. They have farther ſuppoſed, that this very ſubtile fluid, to which they have given the name of *animal ſpirits,* is ſecreted in the cortical ſubſtance of the brain and ſpinal marrow, from whence it paſſes through the medullary ſubſtance. This, like the other ſyſtem, is founded altogether on hypotheſis; but it ſeems to be an hypotheſis derived from much more probable principles, and there are many ingenious arguments to be brought in its ſupport.

EXPLANATION OF PLATE XXIX.

Fig. I. Repreſents the Inferior part of the Brain;—the Anterior part of the whole Spine, including the Medulla Spinalis;—with the origin and large portions of all the Nerves.

A A, The anterior lobes of the cerebrum. B B, The lateral lobes of the cerebrum. C C, The two lobes of the cerebellum. D, Tuber annulare. E, The paſſage from the third ventricle to the infundibulum. F, The medulla oblongata, which ſends off the medulla ſpinalis through the ſpine. G G, That part of the os occipitis which is placed above (H H) the tranverſe proceſſes of the firſt cervical vertebra. I I, &c. The ſeven cervical vertebræ, with their intermediate cartilages. K K, &c. The twelve dorſal vertebræ, with their intermediate cartilages. L L, &c. The five lumbar vertebræ, with their intermediate cartilages. M, The os ſacrum. N, The os coccygis.

Nerves.—1 1, The firſt pair of nerves, named *olfactory,* which go to the noſe. 2 2, The ſecond pair, named *optic,* which goes to form the tunica retina of the eye. 3 3, The third pair, named *motor oculi;* it ſupplies moſt of the muſcles of the eye-ball. 4 4, The fourth pair, named *pathetic,*—which is wholly ſpent upon the muſculus trochlearis of the eye. 5 5, The fifth pair divides into three branches.—The firſt, named *ophthalmic,* goes to the orbit, ſupplies the lachrymal gland, and ſends branches out to the forehead and noſe.—The ſecond, named *ſuperior maxillary,* ſupplies the teeth of the upper jaw, and ſome of the muſcles of the lips.—The third named *inferior maxillary,* is ſpent upon the muſcles and teeth of the lower jaw, tongue, and muſcles of the lips. 6 6, The ſixth pair, which, after ſending off the beginning of the intercoſtal or great ſympathetic, is ſpent upon the abductor oculi. 7 7, The ſeventh pair, named *auditory,* divides into two branches.—The largeſt, named *portio mollis,* is ſpent upon the internal ear.—The ſmalleſt, *portio dura,* joins to the fifth pair within the internal ear by a reflected branch from the ſecond of the fifth; and within the tympanum, by a branch from the third of the fifth, named *chorda tympani.*—Vid. fig. 3. near B. 8 8, &c. The eighth pair, named *par vagum,*—which accompanies the intercoſtal, and is ſpent upon the tongue, larynx, pharynx, lungs, and abdominal viſcera. 9 9, The ninth pair, which are ſpent upon the tongue. 10 10, &c. The intercoſtal, or great ſympathetic, which is ſeen from the ſixth pair to the bottom of the pelvis on each ſide of the ſpine, and joining with all the nerves of the ſpine;—in its progreſs ſupplying the heart, and, with the par vagum, the contents of the abdomen and pelvis. 11 11, The acceſſorius, which is ſpent upon the ſternocleido-maſtoidæus and trapezius muſcles. 12 12, The firſt cervical nerves;—13 13, The ſecond cervical nerves;—both ſpent upon the muſcles that lie on the neck, and teguments of the neck and head. 14 14, The third cervical nerves, which, after ſending off (15 15, &c.) the phrenic nerves to the diaphragm, Of the Brain and Nerves.

ſupply the muſcles and teguments that lie on the ſide of the neck and top of the ſhoulder. 16 16, The brachial plexus, formed by the fourth, fifth, ſixth, ſeventh cervicals, and firſt dorſal nerves.—which ſupply the muſcles and teguments of the ſuperior extremity. 17 17, The twelve dorſal, or proper intercoſtal nerves, which are ſpent upon the intercoſtal muſcles and ſome of the large muſcles which lie upon the thorax. 18 18, The five lumbar pairs of nerves, which ſupply the lumbar and abdominal muſcles, and ſome of the teguments and muſcles of the inferior extremity. 19 19, The ſacro-ſciatic, or poſterior crural nerve, formed by the two inferior lumbar, and three ſuperior of the os ſacrum. This large nerve ſupplies the greateſt part of the muſcles and teguments of the inferior extremity. 20, The ſtomachic plexus, formed by the eighth pair. 21 21, Branches of the ſolar or cæliac plexus, formed by the eighth pair and intercoſtals, which ſupply the ſtomach and chylopoietic viſcera. 22 22, Branches of the ſuperior and inferior meſenteric plexuſes, formed by the eighth pair and intercoſtals, which ſupply the chylopoietic viſcera, with part of the organs of urine and generation. 23 23, Nerves which accompany the ſpermatic cord. 24 24, The hypogaſtric plexus, which ſupplies the organs of urine and generation within the pelvis.

Of the Brain and Nerves.

Fig. 2, 3, 4, 5. Shows different Views of the Inferior part of the Brain, cut perpendicularly through the Middle,—with the Origin and large Portions of all the Nerves which paſs out through the Bones of the Cranium,—and the three firſt Cervicals.

A, The anterior lobe. B, The lateral lobe of the cerebrum. C, One of the lobes of the cerebellum. D, Tuber annulare. E, Corpus pyramidale, in the middle of the medulla oblongata. F, The corpus olivare, in the ſide of the medulla oblongata. G, The medulla oblongata. H, The medulla ſpinalis.

Nerves.—1 2 3 4 5 6 7 8 and 9, Pairs of nerves. 10 10, Nervus acceſſorius, which comes from—11, 12, and 13, The three firſt cervical nerves.

Part VI. Of the SENSES, and their ORGANS.

137 In treating of the ſenſes, we mean to confine ourſelves to the external ones of *touch, taſte, ſmelling, hearing*, and *viſion*. The word *ſenſe*, when applied to theſe five, ſeems to imply not only the ſenſation excited in the mind by certain impreſſions made on the body, but likewiſe the organ deſtined to receive and tranſmit theſe impreſſions to the ſenſorium. Each of theſe organs being of a peculiar ſtructure, is ſuſceptible only of particular impreſſions, which will be pointed out as we proceed to deſcribe each of them ſeparately.

Sect. I. *Of Touch.*

138 The ſenſe of touch may be defined to be the faculty of diſtinguiſhing certain properties of bodies by the feel. In a general acceptation, this definition might perhaps not improperly be extended to every part of the body poſſeſſed of ſenſibility (T), but it is commonly confined to the nervous papillæ of the cutis, or true ſkin, which, with its appendages, and their ſeveral uſes, have been already deſcribed.

The exterior properties of bodies, ſuch as their ſolidity, moiſture, inequality, ſmoothneſs, dryneſs, or fluidity, and likewiſe their degree of heat, ſeem all to be capable of making different impreſſions on the papillæ, and conſequently of exciting different ideas in the ſenſorium commune. But the organ of touch, like all the other ſenſes, is not equally delicate in every part of the body, or in every ſubject; being in ſome much more exquiſite than it is in others.

Sect. II. *Of the Taſte.*

The ſenſe of taſte is ſeated chiefly in the tongue; the ſituation and figure of which are ſufficiently known. 139

On the upper ſurface of this organ we may obſerve a great number of papillæ, which, on account of their difference in ſize and ſhape, are commonly divided into three claſſes. The largeſt are ſituated towards the baſis of the tongue. Their number commonly varies from ſeven to nine, and they ſeem to be mucous follicles. Thoſe of the ſecond claſs are ſomewhat ſmaller, and of a cylindrical ſhape. They are moſt numerous about the middle of the tongue. Thoſe of the third claſs are very minute, and of a conical ſhape. They are

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(T) In the courſe of this article, mention has often been made of the ſenſibility or inſenſibility of different parts of the body: it will therefore, perhaps, not be amiſs to obſerve in this place, that many parts which were formerly ſuppoſed to poſſeſs the moſt exquiſite ſenſe, are now known to have but little or no feeling, at leaſt in a ſound ſtate; for in an inflamed ſtate, even the bones, the moſt inſenſible parts of any, become ſuſceptible of the moſt painful ſenſations. This curious diſcovery is due to the late Baron Haller. His experiments prove, that the bones, cartilages, ligaments, tendons, epidermis, and membranes (as the pleura, pericardium, dura and pia mater, perioſteum, &c.), may in a healthy ſtate be conſidered as inſenſible. As ſenſibility depends on the brain and nerves, of courſe different parts will poſſeſs a greater or leſs degree of feeling, in proportion as they are ſupplied with a greater or ſmaller number of nerves. Upon this principle it is, that the ſkin, muſcles, ſtomach, inteſtines, urinary bladder, ureters, uterus, vagina, penis, tongue, and retina, are extremely ſenſible, while the lungs and glands have only an obſcure degree of feeling.

ANATOMY

Plate XXIX

Fig. 1

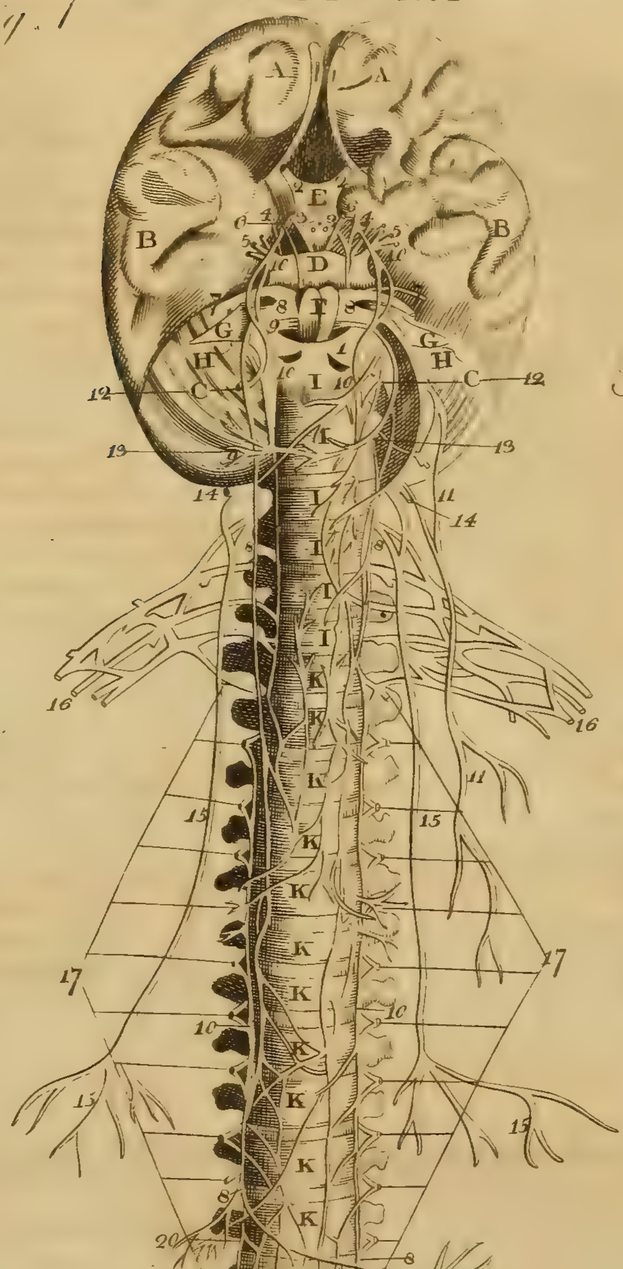


Fig. 2

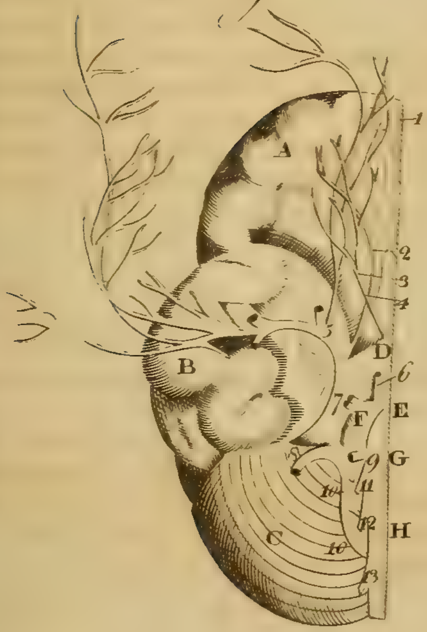


Fig. 3

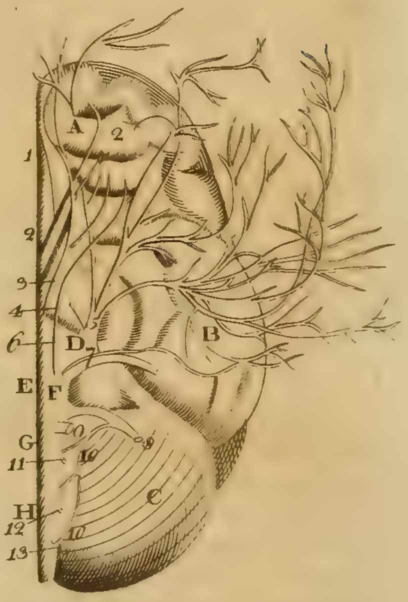


Fig. 4

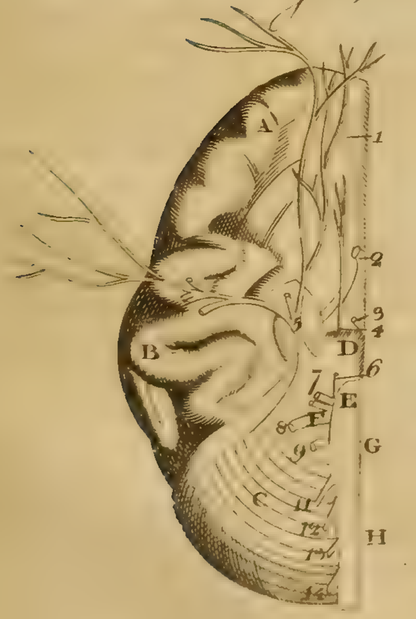
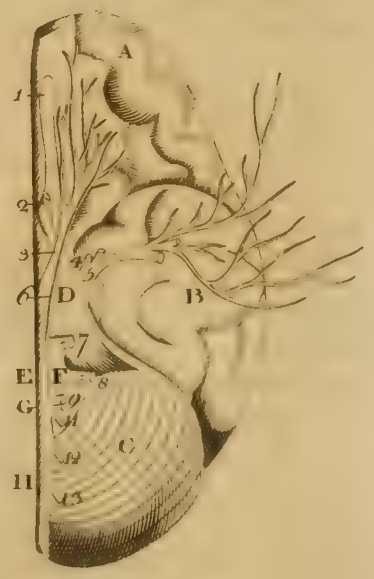


Fig. 5



[illegible]

are very numerous on the apex and edges of the tongue, and have been ſuppoſed to be formed by the extremities of its nerves.

We obſerve a line, the *linea linguæ mediana*, running along the middle of the tongue, and dividing it as it were into two portions. Towards the baſis of the tongue, we meet with a little cavity, named by Morgagni *foramen cæcum*, which ſeems to be nothing more than a common termination of ſome of the excretory ducts of mucous glands ſituated within the ſubſtance of the tongue.

We have already obſerved, that this organ is every where covered by the cuticle, which, by forming a reduplication, called the *frænum*, at its under part, ſerves to prevent the too great motion of the tongue, and to fix it in its ſituation. But, beſides this attachment, the tongue is connected by means of its muſcles and membranous ligaments, to the lower jaw, the os hyoides, and the ſtyloid proceſſes.

The principal arteries of the tongue are the linguales, which ariſe from the external carotid. Its veins empty themſelves into the external jugulars. Its nerves ariſe from the fifth, eighth, and ninth, pair.

The variety of taſtes ſeems to be occaſioned by the different impreſſions made on the papillæ by the food. The different ſtate of the papillæ with reſpect to their moiſture, their figure, or their covering, ſeems to produce a conſiderable difference in the taſte, not only in different people, but in the ſame ſubject, in ſickneſs and in health. The great uſe of the taſte ſeems to be to enable us to diſtinguiſh wholeſome and ſalutary food from that which is unhealthy; and we obſerve that many quadrupeds, by having their papillæ (v) very large and long, have the faculty of diſtinguiſhing flavours with infinite accuracy.

Sect. III. *Of Smelling.*

140. The ſenſe of ſmelling, like the ſenſe of taſte, ſeems intended to direct us to a proper choice of aliment, and is chiefly ſeated in the noſe, which is diſtinguiſhed into its external and internal parts. The ſituation and figure of the former of theſe do not ſeem to require a definition. It is compoſed of bones and cartilages, covered by muſcular fibres and by the common integuments. The bones make up the upper portion, and the cartilages the lower one. The ſeptum narium, like the noſe, is likewiſe in part bony, and in part cartilaginous. Theſe bones and their connections were deſcribed in the oſteology.

The internal part of the noſe, beſides the oſſa ſpongioſa, has ſix cavities or ſinuſes, the maxillary, the frontal, and the ſphenoid, which were all deſcribed with the bones of the head. They all open into the noſtrils; and the noſe likewiſe communicates with the mouth, larynx, and pharynx, poſteriorly behind the velum palati.

All theſe ſeveral parts, which are included in the internal diviſion of the noſe, viz. the inner ſurface of the noſtrils, the lamellæ of the oſſa ſpongioſa, and the ſinuſes, are lined by a thick and very vaſcular membrane, which, though not unknown to the ancients, was firſt well deſcribed by Schneider*, and is therefore now commonly named *membrana pituitaria Schneideri*. This membrane is truly the organ of ſmelling; but its real ſtructure does not yet ſeem to be perfectly underſtood. It appears to be a continuation of the cuticle, which lines the inner ſurface of the mouth. In ſome parts of the noſe it is ſmooth and firm, and in others it is looſe and ſpongy. It is conſtantly moiſtened by a mucous ſecretion; the finer parts of which are carried off by the air we breathe, and the remainder, by being retained in the ſinuſes, acquires conſiderable conſiſtence. The manner in which this mucus is ſecreted has not yet been ſatisfactorily aſcertained; but it ſeems to be by means of mucous follicles.

Its arteries are branches of the internal maxillary and internal carotid. Its veins empty themſelves into the internal jugulars. The firſt pair of nerves, the olfactory, are ſpread over every part of it, and it likewiſe receives branches from the fifth pair.

After what has been ſaid of the pituitary membrane, it will not be difficult to conceive how the air we draw in at the noſtrils, being impregnated with the effluvia of bodies, excites in us that kind of ſenſation we call *ſmelling*. As theſe effluvia, from their being exceedingly light and volatile, cannot be capable in a ſmall quantity of making any great impreſſion on the extremities of the olfactory nerves, it was neceſſary to give conſiderable extent to the pituitary membrane, that by this means a greater number of odoriferous particles might be admitted at the ſame time. When we wiſh to take in much of the effluvia of any thing, we naturally cloſe the mouth, that all the air we inſpire may paſs through the noſtrils; and at the ſame time, by means of the muſcles of the noſe, the noſtrils are dilated, and a greater quantity of air is drawn into them.

In many quadrupeds, the ſenſe of ſmelling is much more extenſive and delicate than it is in the human ſubject; and in the human ſubject it ſeems to be more perfect the leſs it is vitiated by a variety of ſmells. It is not always in the ſame ſtate of perfection, being naturally affected by every change of the pituitary membrane, and of the lymph with which that membrane is moiſtened.

Sect. IV. *Of Hearing.*

Before we undertake to explain the manner in which we are enabled to receive the impreſſions of ſound, it will be neceſſary to deſcribe the *ear*, which is the *organ of hearing*. It is commonly diſtinguiſhed into external and internal. The former of theſe diviſions includes all that we are able to diſcover without diſſection, and the meatus auditorius, as far as the tympanum; and the latter, all the other parts of the ear. 141.

The *external ear* is a cartilaginous funnel, covered by the common integuments, and attached, by means of its ligaments and muſcles, to the temporal bone. Although capable only of a very obſcure motion, it is

* *De Catarrho*, lib. iii.

(v) Malpighi's deſcription of the papillæ, which has been copied by many anatomical writers, ſeems to have been taken chiefly from the tongues of ſheep.

found to have ſeveral muſcles. Different parts of it are diſtinguiſhed by ſeveral names; all its cartilaginous part is called *ala* or *wing*, to diſtinguiſh it from the ſoft and pendent part below, called the *lobe*. Its outer circle or border is called *helix*, and the ſemicircle within this, *antihelix*. The moveable cartilage placed immediately before the meatus auditorius, which it may be made to cloſe exactly, is named *tragus;* and an eminence oppoſite to this at the extremity of the antihelix, is called *antitragus*. The concha is a conſiderable cavity formed by the extremities of the helix and antihelix. The meatus auditorius, which at its opening is cartilaginous, is lined with a very thin membrane, which is a continuation of the cuticle from the ſurface of the ear.

In this canal we find a yellow wax, which is ſecreted by a number of minute glands or follicles, each of which has an excretory duct. This ſecretion, which is at firſt of an oily conſiſtence, defends the membrane of the tympanum from the injuries of the air; and by its bitterneſs, prevents minute inſects from entering into the ear. But when from neglect or diſeaſe it accumulates in too great a quantity, it ſometimes occaſions deafneſs. The inner extremity of the meatus is cloſed by a very thin tranſparent membrane, the membrana tympani, which is ſet in a bony circle like the head of a drum. In the laſt century Rivinus, profeſſor at Leipſic, fancied he had diſcovered a hole in this membrane, ſurrounded by a ſphincter, and affording a paſſage to the air, between the external and internal ear. Cowper, Heiſter, and ſome other anatomiſts, have admitted this ſuppoſed foramen, which certainly does not exiſt. Whenever there is any opening in the membrana tympani, it may be conſidered as accidental. Under the membrana tympani runs a branch of the fifth pair of nerves, called *chorda tympani;* and beyond this membrane is the cavity of the tympanum, which is about ſeven or eight lines wide, and half ſo many in depth; it is ſemiſpherical, and every where lined by a very fine membrane. There are four openings to be obſerved in this cavity. It communicates with the mouth by means of the Euſtachian tube. This canal, which is in part bony and in part cartilaginous, begins by a very narrow opening at the anterior and almoſt ſuperior part of the tympanum, increaſing in ſize as it advances towards the palate of the mouth, where it terminates by an oval opening. This tube is every where lined by the ſame membrane that covers the inſide of the mouth. The real uſe of this canal does not ſeem to have been hitherto ſatisfactorily aſcertained; but ſound would ſeem to be conveyed through it to the membrana tympani, deaf perſons being often obſerved to liſten attentively with their mouths open. Oppoſite to this is a minute paſſage, which leads to the ſinuoſities of the maſtoid proceſs; and the two other openings, which are in the internal proceſs of the os petroſum, are the feneſtra ovalis, and feneſtra rotunda, both of which are covered by a very fine membrane.

There are three diſtinct bones in the cavity of the tympanum; and theſe are the malleus, incus, and ſtapes. Beſides theſe there is a fourth, which is the *os orbiculare*, conſidered by ſome anatomiſts as a proceſs of the ſtapes, which is neceſſarily broken off by the violence we are obliged to uſe in getting at theſe bones; but when accurately conſidered, it ſeems to be a diſtinct bone.

The *malleus* is ſuppoſed to reſemble a hammer, being larger at one extremity, which is its head, than it is at the other, which is its handle. The latter is attached to the membrana tympani, and the head of the bone is articulated with the incus.

The *incus*, as it is called from its ſhape, though it ſeems to have leſs reſemblance to an anvil than to one of the dentes molares with its roots widely ſeparated from each other, is diſtinguiſhed into its body and its legs. One of its legs is placed at the entry of the canal which leads to the maſtoid proceſs; and the other, which is ſomewhat longer, is articulated with the ſtapes, or rather with the os orbiculare, which is placed between them.

The third bone is very properly named *ſtapes*, being perfectly ſhaped like a ſtirrup. Its baſis is fixed into the feneſtra ovalis, and its upper part is articulated with the os orbiculare. What is called the *feneſtra rotunda*, though perhaps improperly, as it is more oval than round, is obſerved a little above the other, in an eminence formed by the os petroſum, and is cloſed by a continuation of the membrane that lines the inner ſurface of the tympanum. The ſtapes and malleus are each of them furniſhed with a little muſcle, the ſtapedeus and tenſor tympani. The firſt of theſe, which is the ſmalleſt in the body, ariſes from a little cavern in the poſterior and upper part of the cavity of the tympanum; and its tendon, after paſſing through a hole in the ſame cavern, is inſerted at the back part of the head of the ſtapes. This muſcle, by drawing the ſtapes obliquely upwards, aſſiſts in ſtretching the membrana tympani.

The tenſor tympani (x), or internus mallei, as it is called by ſome writers, ariſes from the cartilaginous extremity of the Euſtachian tube, and is inſerted into the back part of the handle of the malleus, which it ſerves to pull inwards, and of courſe helps to ſtretch the membrana tympani.

The labyrinth is the only part of the ear which remains to be deſcribed. It is ſituated in the os petroſum, and is ſeparated from the tympanum by a partition which is every where bony, except at the two feneſtræ. It is compoſed of three parts; and theſe are the veſtibulum, the ſemicircular canals, and the cochlea.

The *veſtibulum* is an irregular cavity, much ſmaller than the tympanum, ſituated nearly in the centre of the os petroſum, between the tympanum, the cochlea, and the ſemicircular canals. It is open on the ſide of the tympanum by means of the feneſtra ovalis, and communicates with the upper portion of the cochlea by an oblong foramen, which is under the feneſtra ovalis, from which it is ſeparated only by a very thin partition.

Each of the three *ſemicircular canals* forms about half a circle of nearly a line in diameter, and running each in a different direction, they are diſtinguiſhed into *vertical*, *oblique*, and *horizontal*. Theſe three canals open by both their extremities into the veſtibulum; but the vertical and the oblique being united together at one of their extremities, there are only five orifices to be ſeen in the veſtibulum.

(x) Some anatomiſts deſcribe three muſcles of the malleus; but only this one ſeems to deſerve the name of muſcle; what are called the *externus* and *obliquus mollei*, ſeeming to be ligaments rather than muſcles.

The *cochlea* is a canal which takes a ſpiral courſe, not unlike the ſhell of a ſnail. From its baſis to its apex it makes two turns and a half; and is divided into two canals by a very thin lamina or ſeptum, which is in part bony and in part membranous, in ſuch a manner that theſe two canals only communicate with each other at the point. One of them opens into the veſtibulum, and the other is covered by the membrane that cloſes the feneſtra rotunda. The bony lamella which ſeparates the two canals is exceedingly thin, and fills about two thirds of the diameter of the canal. The reſt of the ſeptum is compoſed of a moſt delicate membrane, which lines the whole inner ſurface of the cochlea, and ſeems to form this diviſion in the ſame manner as the two membranous bags of the pleura, by being applied to each other, form the mediaſtinum.

Every part of the labyrinth is furniſhed with a very delicate perioſteum, and filled with a watery fluid, ſecreted as in other cavities. This fluid tranſmits to the nerves the vibrations it receives from the membrane cloſing the feneſtra rotunda, and from the baſis of the ſtapes, where it reſts on the feneſtrum ovale. When this fluid is collected in too great a quantity, or is compreſſed by the ſtapes, it is ſuppoſed to eſcape through two minute canals or aqueducts, lately deſcribed by Dr Cotunni *, an ingenious phyſician at Naples. One of theſe aqueducts opens into the bottom of the veſtibulum, and the other into the cochlea, near the feneſtra rotunda. They both paſs through the os petroſum, and communicate with the cavity of the cranium where the fluid that paſſes through them is abſorbed; and they are lined by a membrane which is ſuppoſed to be a production of the dura mater.

* *De aquæductibus Auris Humanæ Internæ*, 8vo, 1760.

The arteries of the external ear come from the temporal and other branches of the external carotid, and its veins paſs into the jugular. The internal ear receives branches of arteries from the baſilary and carotids, and its veins empty themſelves into the ſinuſes of the dura mater, and into the internal jugular.

The portio mollis of the ſeventh pair is diſtributed through the cochlea, the veſtibulum, and the ſemicircular canals; and the portio dura ſends off a branch to the tympanum, and other branches to the external ear and parts near it.

The *ſenſe of hearing*, in producing which all the parts we have deſcribed aſſiſt, is occaſioned by a certain modulation of the air collected by the funnel-like ſhape of the external ear, and conveyed through the meatus auditorius to the membrana tympani. That ſound is propagated by means of the air, is very eaſily proved by ringing a bell under the receiver of an air-pump; the ſound it affords being found to diminiſh gradually as the air becomes exhauſted, till at length it ceaſes to be heard at all. Sound moves through the air with infinite velocity; but the degree of its motion ſeems to depend on the ſtate of the air, as it conſtantly moves faſter in a denſe and dry, than it does in a moiſt and rarefied air. See *Acouſtics*, nº 20.

That the air vibrating on the membrana tympani communicates its vibration to the different parts of the labyrinth, and by means of the fluid contained in this cavity affects the auditory nerve ſo as to produce ſound, ſeems to be very probable; but the ſituation, the minuteneſs, and the variety of the parts which compoſe the ear, do not permit much to be advanced with certainty concerning their mode of action.

Some of theſe parts ſeem to conſtitute the immediate organ of hearing, and theſe are all the parts of the veſtibulum: but there are others which ſeem intended for the perfection of this ſenſe, without being abſolutely eſſential to it. It has happened, for inſtance, that the membrana tympani, and the little bones of the ear, have been deſtroyed by diſeaſe, without depriving the patient of the ſenſe of hearing (y).

Sound is more or leſs loud in proportion to the ſtrength of the vibration; and the variety of ſounds ſeems to depend on the difference of this vibration; for the more quick and frequent it is, the more acute will be the ſound, and *vice verſa*.

Before we conclude this article, it will be right to explain certain phenomena, which will be found to have a relation to the organ of hearing.

Every body has, in conſequence of particular ſounds, occaſionally felt that diſagreeable ſenſation which is uſually called *ſetting the teeth on edge*: and the cauſe of this ſenſation may be traced to the communication which the portio dura of the auditory nerve has with the branches of the fifth pair that are diſtributed to the teeth, being probably occaſioned by the violent tremor produced in the membrana tympani by theſe very acute ſounds. Upon the ſame principle we may explain the ſtrong idea of ſound which a perſon has who holds a vibrating ſtring between his teeth.

The humming which is ſometimes perceived in the ear, without any exterior cauſe, may be occaſioned either by an increaſed action of the arteries in the ears, or by convulſive contractions of the muſcles of the malleus and ſtapes, affecting the auditory nerve in ſuch a manner as to produce the idea of ſound. An ingenious philoſophical writer * has lately diſcovered, that there are ſounds liable to be excited in the ear by irritation, and without any aſſiſtance from the vibrations of the air.

* *Elliot's Philoſophical Obſervations on the Senſes of Viſion and Hearing*, 8vo.

SECT. V. *Of Viſion* †.

† *See Optics*. 142.

THE eyes, which conſtitute the organ of viſion, are ſituated in two bony cavities named *orbits*, where they are ſurrounded by ſeveral parts, which are either intended to protect them from external injury, or to aſſiſt in their motion.

(y) This obſervation has led to a ſuppoſition, that a perforation of this membrane may in ſome caſes of deafneſs be uſeful; and Mr Cheſelden relates, that, ſome years ago, a malefactor was pardoned on condition that he ſhould ſubmit to this operation; but the public clamour raiſed againſt it was ſo great, that it was thought right not to perform it.

The globe of the eye is immediately covered by two eye-lids or palpebræ, which are compoſed of muſcular fibres covered by the common integuments, and lined by a very fine and ſmooth membrane, which is from thence extended over part of the globe of the eye, and is called *tunica conjunctiva*. Each eye-lid is cartilaginous at its edge; and this border which is called *tarſus*, is furniſhed with a row of hairs named *cilia* or *eye-laſhes*.

The cilia ſerve to protect the eye from inſects and minute bodies floating in the air, and likewiſe to moderate the action of the rays of light in their paſſage to the retina. At the roots of theſe hairs there are ſebaceous follicles, firſt noticed by Meibomius, which diſcharge a glutinous liniment. Sometimes the fluid they ſecrete has too much viſcidity, and the eye-lids become glued to each other.

The upper border of the orbit is covered by the eye-brows or ſupercilia, which by means of their two muſcles are capable of being brought towards each other, or of being carried upwards. They have been conſidered as ſerving to protect the eyes, but they are probably intended more for ornament than utility (z).

The orbits, in which the eyes are placed, are furniſhed with a good deal of fat, which affords a ſoft bed on which the eye performs its ſeveral motions. The inner angle of each orbit, or that part of it which is near the noſe, is called *canthus major*, or the *great angle*; and the outer angle, which is on the oppoſite ſide of the eye, is the *canthus minor*, or *little angle*.

The little reddiſh body which we obſerve in the great angle of the eye-lids, and which is called *caruncula lachrymalis*, is ſuppoſed to be of a glandular ſtructure, and, like the follicles of the eye-lids, to ſecrete an oily humour. But its ſtructure and uſe do not ſeem to have been hitherto accurately determined. The ſurface of the eye is conſtantly moiſtened by a very fine limpid fluid called the *tears*, which is chiefly, and perhaps wholly, derived from a large gland of the conglomerate kind, ſituated in a ſmall depreſſion of the os frontis near the outer angle of the eye. Its excretory ducts pierce the tunica conjunctiva juſt above the cartilaginous borders of the upper eye-lids. When the tears were ſuppoſed to be ſecreted by the caruncule, this gland was called *glandula innominata*; but now that its ſtructure and uſes are aſcertained, it very properly has the name of *glandula lachrymalis*. The tears poured out by the ducts of this gland are, in a natural and healthy ſtate, inceſſantly ſpread over the ſurface of the eye, to keep it clear and tranſparent, by means of the eye-lids, and as conſtantly paſs out at the oppoſite corner of the eye or inner angle, through two minute orifices, the puncta lachrymalia (A); being determined into theſe little openings by a reduplication of the tunica conjunctiva, ſhaped like a creſcent, the two points of which anſwer to the puncta. This reduplication is named *membrana*, or *valvula ſemilunaris*. Each of theſe puncta is the beginning of a ſmall excretory tube, through which the tears paſs into a little pouch or reſervoir, the ſacculus lachrymalis, which lies in an excavation formed partly by the naſal proceſs of the os maxillare ſuperius, and partly by the os unguis. The lower part of this ſac forms a duct called the *ductus ad nares*, which is continued through a bony channel, and opens into the noſe, through which the tears are occaſionally diſcharged (B).

The motions of the eye are performed by ſix muſcles; four of which are ſtraight and two oblique. The ſtraight muſcles are diſtinguiſhed by the names of *elevator*, *depreſſor*, *adductor*, and *abductor*, from their ſeveral uſes in elevating and depreſſing the eye, drawing it towards the noſe, or carrying it from the noſe towards the temple. All theſe four muſcles ariſe from the bottom of the orbit, and are inſerted by flat tendons into the globe of the eye. The oblique muſcles are intended for the more compound motions of the eye. The firſt of theſe muſcles, the obliquus ſuperior, does not, like the other four muſcles we have deſcribed, ariſe from the bottom of the orbit, but from the edge of the foramen that tranſmits the optic nerve, which ſeparates the origin of this muſcle from that of the others. From this beginning it paſſes in a ſtraight line towards a very ſmall cartilaginous ring, the ſituation of which is marked in the ſkeleton by a little hollow in the internal orbitar proceſs of the os frontis. The tendon of the muſcle, after paſſing through this ring, is inſerted into the upper part of the globe of the eye, which it ſerves to draw forwards, at the ſame time turning the pupil downwards.

The obliquus inferior ariſes from the edge of the orbit, under the opening of the ductus lachrymalis; and is inſerted ſomewhat poſteriorly into the outer ſide of the globe, ſerving to draw the eye forwards and turn the pupil upwards. When either of theſe two muſcles acts ſeparately, the eye is moved on its axis; but when they act together, it is compreſſed both above and below. The eye itſelf, which is now to be deſcribed, with its tunics, humours, and component parts, is nearly of a ſpherical figure. Of its tunics, the conjunctiva has been already deſcribed as a partial covering, reflected from the inner ſurface of the eye-lids over the anterior portion of the eye. What has been named *albuginea* cannot properly be conſidered as a coat of the eye, being in fact nothing more than the tendons of the ſtraight muſcles ſpread over ſome parts of the ſclerotica.

The immediate tunics of the eye, which are to be demonſtrated when its partial coverings, and all the other parts with which it is ſurrounded, are removed, are the ſclerotica, cornea, choroides, and retina.

The *ſclerotica*, which is the exterior coat, is every

(z) It is obſervable, that the eye-brows are peculiar to the human ſpecies.

(A) It ſometimes happens, that this very pellucid fluid, which moiſtens the eye, being poured out through the excretory ducts of the lachrymal gland faſter than it can be carried off through the puncta, trickles down the cheek, and is then ſtrictly and properly called *tears*.

(B) When the ductus ad nares becomes obſtructed in conſequence of diſeaſe, the tears are no longer able to paſs into the noſtrils; the ſacculus lachrymalis becomes diſtended; and inflammation, and ſometimes ulceration, taking place, conſtitute the diſeaſe called *fiſtula lachrymalis*.

where white and opaque, and is joined at its anterior edge to another, which has more convexity than any other part of the globe, and being exceedingly tranſparent is called *cornea* (c). Theſe two parts are perfectly different in their ſtructure; ſo that ſome anatomiſts ſuppoſe them to be as diſtinct from each other as the glaſs of a watch is from the caſe into which it is fixed. The ſclerotica is of a compact fibrous ſtructure; the cornea, on the other hand, is compoſed of a great number of laminæ united by cellular membrane. By macerating them in boiling water, they do not ſeparate from each other, as ſome writers have aſſerted; but the cornea ſoon ſoftens, and becomes of a glutinous conſiſtence.

The ancients ſuppoſed the ſclerotica to be a continuation of the dura mater. Morgagni and ſome other modern writers are of the ſame opinion; but this point is diſputed by Winſlow, Haller, Zin, and others. The truth ſeems to be, that the ſclerotica, though not a production of the dura mater, adheres intimately to that membrane.

The *choroides* is ſo called becauſe it is furniſhed with a great number of veſſels. It has likewiſe been named *uvea*, on account of its reſemblance to a grape. Many modern anatomical writers have conſidered it as a production of the pia mater. This was likewiſe the opinion of the ancients; but the ſtrength and thickneſs of the choroides, when compared with the delicate ſtructure of the pia mater, are ſufficient proofs of their being two diſtinct membranes.

The choroides has of late generally been deſcribed as conſiſting of two laminæ; the innermoſt of which has been named after Ruyſch, who firſt deſcribed it. It is certain, however, that Ruyſch's diſtinction is ill founded, at leaſt with reſpect to the human eye, in which we are unable to demonſtrate any ſuch ſtructure, although the tunica choroides of ſheep and ſome other quadrupeds may eaſily be ſeparated into two layers.

The choroides adheres intimately to the ſclerotica round the edge of the cornea; and at the place of this union, we may obſerve a little whitiſh areola, named *ligamentum ciliare*, though it is not of a ligamentous nature.

They who ſuppoſe the choroides to be compoſed of two laminæ, deſcribe the external one as terminating in the ligamentum ciliare, and the internal one as extending farther to form the iris, which is the circle we are able to diſtinguiſh through the cornea: but this part is of a very different ſtructure from the choroides; ſo that ſome late writers have perhaps not improperly conſidered the iris as a diſtinct membrane. It derives its name from the variety of its colours, and is perforated in the middle. This perforation, which is called the *pupil* or *ſight* of the eye, is cloſed in the fœtus by a very thin vaſcular membrane. This membrana pupillaris commonly diſappears about the ſeventh month.

On the under ſide of the iris we obſerve many minute fibres, called *ciliary proceſſes*, which paſs in radii or parallel lines from the circumference to the centre. The contraction and dilatation of the pupil are ſuppoſed to depend on the action of theſe proceſſes. Some have conſidered them as muſcular, but they are not of an irritable nature; others have ſuppoſed them to be filaments of nerves: but their real ſtructure has never yet been clearly aſcertained.

Beſides theſe ciliary proceſſes, anatomiſts uſually ſpeak of the circular fibres of the iris, but no ſuch ſeem to exiſt.

The poſterior ſurface of the iris, the ciliary proceſſes, and part of the tunica choroides, are covered by a black mucus for the purpoſes of accurate and diſtinct viſion; but the manner in which it is ſecreted has not been determined.

Immediately under the tunica choroides we find the third and inner coat, called the *retina*, which ſeems to be merely an expanſion of the pulpy ſubſtance of the optic nerve, extending to the border of the cryſtaline humour.

The greateſt part of the globe of the eye, within theſe ſeveral tunics, is filled by a very tranſparent and gelatinous humour of conſiderable conſiſtence, which, from its ſuppoſed reſemblance to fuſed glaſs, is called the *vitreous humour*. It is inveſted by a very fine and delicate membrane, called *tunica vitrea*, and ſometimes *arachnoides*.—It is ſuppoſed to be compoſed of two laminæ; one of which dips into its ſubſtance, and by dividing the humour into cells adds to its firmneſs. The fore-part of the vitreous humour is a little hollowed, to receive a very white and tranſparent ſubſtance of a firm texture, and of a lenticular and ſomewhat convex ſhape, named the *cryſtaline humour*. It is included in a capſula, which ſeems to be formed by a ſeparation of the two laminæ of the tunica vitrea.

The fore-part of the eye is filled by a very thin and tranſparent fluid, named the *aqueous humour*, which occupies all the ſpace between the cryſtalline and the prominent cornea.—The part of the choroides which is called the *iris*, and which comes forward to form the pupil, appears to be ſuſpended as it were in this humour, and has occaſioned this portion of the eye to be diſtinguiſhed into two parts. One of theſe, which is the little ſpace between the anterior ſurface of the cryſtalline and the iris, is called the *poſterior chamber*; and the other, which is the ſpace between the iris and the cornea, is called the *anterior chamber* of the eye (D). Both theſe ſpaces are completely filled with the aqueous humour. (E).

The eye receives its arteries from the internal carotid

(C) Some writers, who have given the name of *cornea* to all this outer coat, have named what is here and moſt commonly called *ſclerotica, cornea opaca;* and its anterior and tranſparent portion, *cornea lucida*.

(D) We are aware that ſome anatomiſts, particularly Lieutaud, are of opinion, that the iris is every where in cloſe contact with the cryſtalline, and that it is of courſe right to ſpeak only of one chamber of the eye: but as this does not appear to be the caſe, the ſituation of the iris and the two chambers of the eye are here deſcribed in the uſual way.

(E) When the cryſtalline becomes opaque, ſo as to prevent the paſſage of the rays of light to the retina, it conſtitutes what is called a *cataract;* and the operation of couching conſiſts in removing the diſeaſed cryſtalline from tid through the foramina optica; and its veins paſs through the foramina lacera, and empty themſelves into the lateral ſinuſes. Some of the ramifications of theſe veſſels appear on the inner ſurface of the iris, where they are ſeen to make very minute convolutions, which are ſufficiently remarkable to be diſtinguiſhed by the name of *circulus arterioſus*, though perhaps improperly, as they are chiefly branches of veins.

The optic nerve paſſes in at the poſterior part of the eye, in a conſiderable trunk, to be expanded for the purpoſes of viſion, of which it is now univerſally ſuppoſed to be the immediate ſeat. But Meſſrs Mariotte and Mery contended, that the choroides is the ſeat of this ſenſe; and the ancients ſuppoſed the cryſtalline to be ſo. Beſides the optic, the eye receives branches from the third, fourth, fifth, and ſixth pair of nerves.

The humours of the eye, together with the cornea, are calculated to refract and converge the rays of light in ſuch a manner as to form at the bottom of the eye a diſtinct image of the object we look at; and the point where theſe rays meet is called the *focus* of the eye. On the retina, as in the *camera obſcura*, the object is painted in an inverted poſition; and it is only by habit that we are enabled to judge of its true ſituation, and likewiſe of its diſtance and magnitude. To a young gentleman who was born blind, and who was couched by Mr Cheſelden, every object (as he expreſſed himſelf) ſeemed to touch his eyes as what he felt did his ſkin; and he thought no objects ſo agreeable as thoſe which were ſmooth and regular, although for ſome time he could form no judgment of their ſhape, or gueſs what it was in any of them that was pleaſing to him.

In order to paint objects diſtinctly on the retina, the cornea is required to have ſuch a degree of convexity, that the rays of light may be collected at a certain point, ſo as to terminate exactly on the retina.—If the cornea is too prominent, the rays, by diverging too ſoon, will be united before they reach the retina, as is the caſe with near-ſighted people or *myopes*; and on the contrary, if it is not ſufficiently convex, the rays will not be perfectly united when they reach the back-part of the eye; and this happens to long-ſighted people or *preſbi*, being found conſtantly to take place as we approach to old age, when the eye gradually flattens (F). Theſe defects are to be ſupplied by means of glaſſes. He who has too prominent an eye, will find his viſion improved by means of a concave glaſs; and upon the ſame principles, a convex glaſs will be found uſeful to a perſon whoſe eye is naturally too flat.

EXPLANATION OF PLATE XXX.

FIGURE 1. Shows the Lachrymal Canals, after the Common Teguments and Bones have been cut away.

a, The lachrymal gland. b, The two puncta lachrymalia, from which the two lachrymal canals proceed to c, The lachrymal ſac. d, The large lachrymal duct. e, Its opening into the noſe. f, The caruncula lachrymalis. g, The eye-ball.

FIG. 2. An interior View of the Coats and Humours of the Eye.

a a a a, The tunica ſclerotica cut in four angles, and turned back. b b b b, The tunica choroides adhering to the inſide of the ſclerotica, and the ciliary veſſels are ſeen paſſing over—c c, The retina which covers the vitreous humour. d d, The ciliary proceſſes, which were continued from the choroid coat. e e, The iris. f, The pupil.

FIG. 3. Shows the Optic Nerves, and Muſcles of the Eye.

a a, The two optic nerves before they meet. b, The two optic nerves conjoined. c, The right optic nerve. d, Muſculus attollens palpebræ ſuperioris. e, Attollens oculi. f, Abductor. g g, Obliquus ſuperior, or trochlearis. h, Adductor. i, The eye-ball.

FIG. 4. Shows the Eye-ball with its Muſcles.

a, The optic nerve. b, Muſculus trochlearis. c, Part of the os frontis, to which the trochlea or pully is fixed, through which,—d, The tendons of the trochlearis paſſes. e, Attollens oculi. f, Adductor oculi. g, Abductor oculi. h, Obliquus inferior. i, Part of the ſuperior maxillary bone to which its fixed. k, The eye-ball.

FIG. 5. Repreſents the Nerves and Muſcles of the Right Eye, after part of the Bones of the orbit have been cut away.

A, The eye-ball. B, The lachrymal gland. C, Muſculus abductor oculi. D, Attollens. E, Levator palpebræ ſuperioris. F, Depreſſor oculi. G, Adductor. H, Obliquus ſuperior, with its pully. I, Its inſertion into the ſclerotic coat. K, Part of the obliquus inferior. L, The anterior part of the os frontis cut. M, The criſta galli of the ethmoid bone. N, The poſterior part of the ſphenoid bone. O, Tranſverſe ſpinous proceſs of the ſphenoid bone. P, The carotid artery, denuded where it paſſes through the bones. Q, The carotid artery within the cranium. R, The ocular artery.

NERVES.—a a, The optic nerve. b, The third pair.—c, Its joining with a branch of the firſt branch of the fifth pair, to form l,—The lenticular ganglion, which ſends off the ciliary nerves, d. e e, The fourth pair. f, The trunk of the fifth pair. g, The firſt branch of the fifth pair, named ophthalmic.—h, The frontal branch of it. i, Its ciliary branches, along with which the naſal twig is ſent to the noſe. k, Its branch to the lachrymal gland. l, The lenticular ganglion. m, The ſecond branch of the fifth pair, named ſuperior maxillary. n, The third branch of the fifth pair, named inferior maxillary. o, The ſixth pair of

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from its bed in the vitreous humour. In this operation the cornea is perforated, and the aqueous humour eſcapes out of the eye, but it is conſtantly renewed again in a very ſhort time. The manner, however, in which it is ſecreted, has not yet been determined.

(F) Upon this principle, they who in their youth are near-ſighted may expect to ſee better as they advance in life, as their eyes gradually become more flat.

Fig. 3

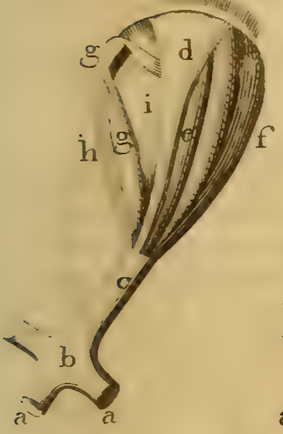


Fig. 1

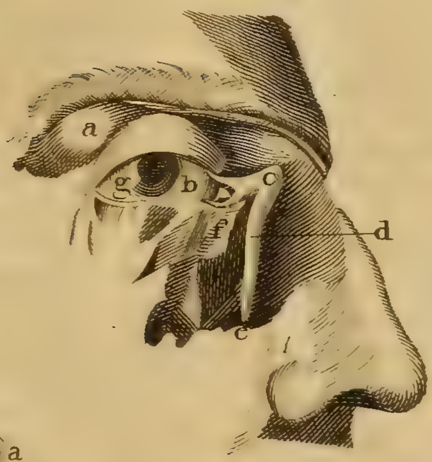


Fig. 6

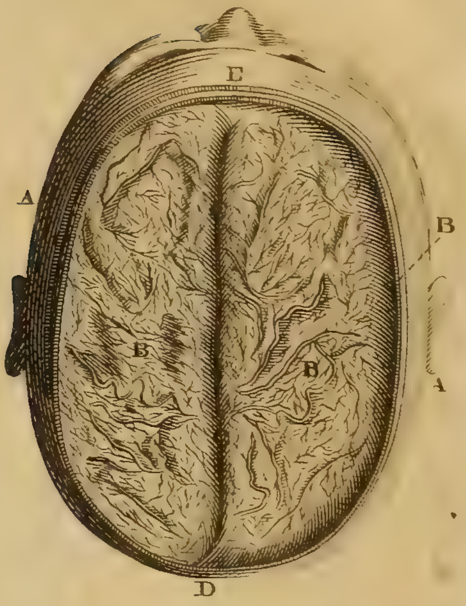


Fig. 2

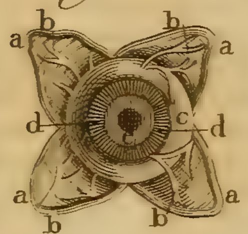


Fig. 7

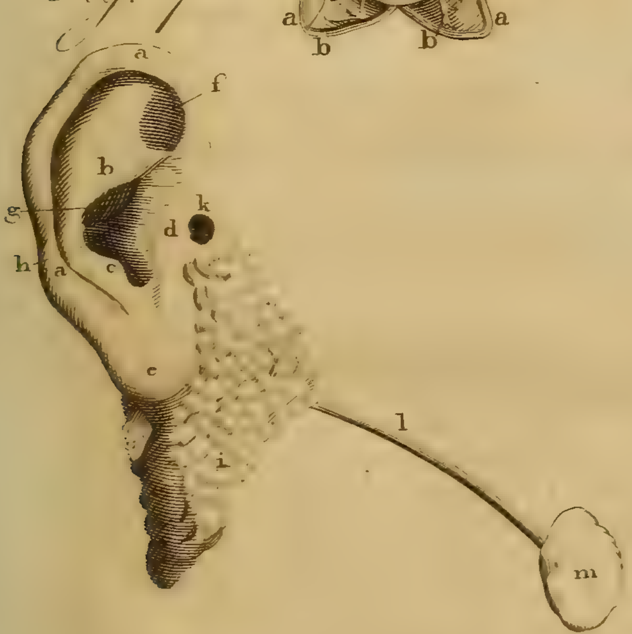


Fig. 4

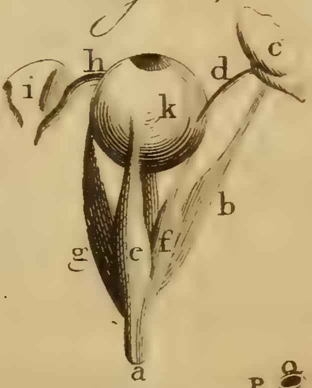


Fig. 5

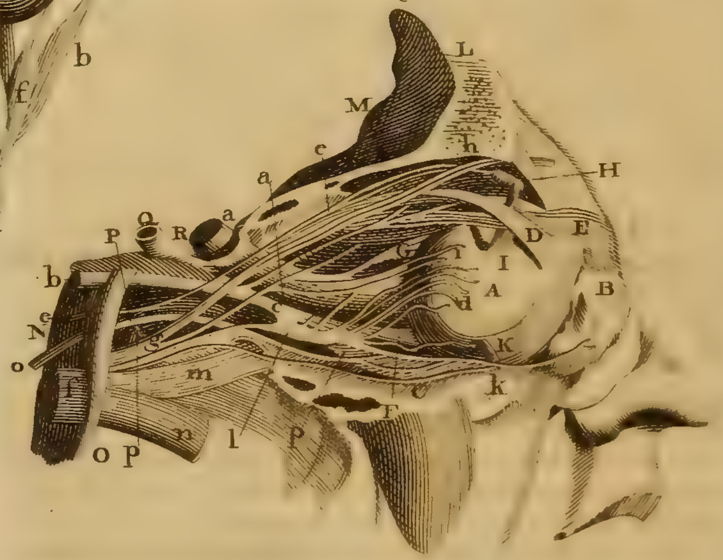


Fig. 10

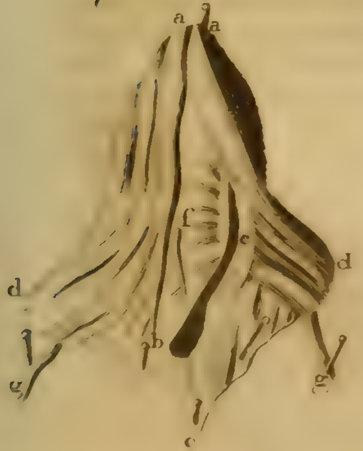


Fig. 9

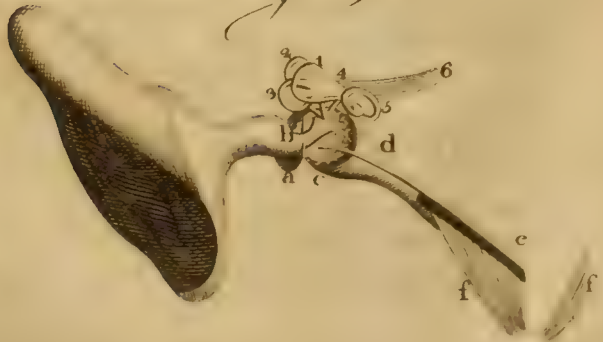
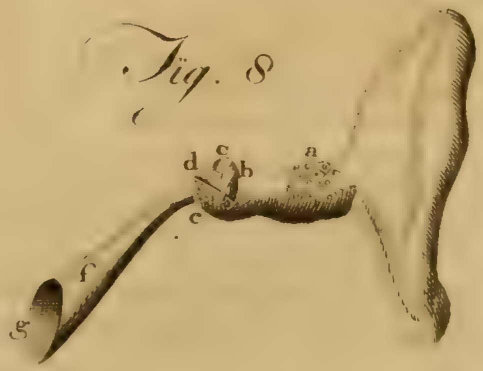


Fig. 8



Law. Philad.

Of the Senſes.

of nerves,—which ſends off p, The beginning of the great ſympathetic. q, The remainder of the ſixth pair, ſpent on c, The abductor oculi.

Fig. 6. Repreſents the head of a youth, where the upper part of the cranium is ſawed off,—to ſhow the upper part of the brain, covered by the pia mater, the veſſels of which are minutely filled with wax.

A A, The cut edges of the upper part of the cranium. B, The two tables and intermediate diploë. B B, The two hemiſpheres of the cerebrum. C C, The inciſure made by the falx. D, Part of the tentorium cerebello ſuper expanſum. E, part of the falx, which is fixed to the criſta galli.

Fig. 7. Repreſents the parts of the External Ear, with the Parotid Gland and its Duct.

a a, The helix. b, The antihelix. c, The antitragus. d, The tragus. e, The lobe of the ear. f, The cavitas innominata. g, The ſcapha. h, The concha. i i, The parotid gland. k, A lymphatic gland, which is often found before the tragus. l, The duct of the parotid gland. m, Its opening into the mouth.

Fig. 8. A view of the poſterior part of the external ear, meatus auditorius, tympanum, with the ſmall bones, and Euſtachian tube of the right ſide.

a, The back part of the meatus, with the ſmall ceruminous glands. b, The incus. c, Malleus. d, The chorda tympani. e, Membrana tympani. f, The Euſtachian tube. g, Its mouth from the fauces.

Fig. 9. Repreſents the anterior part of the right external ear, the cavity of the tympanum—its ſmall bones, cochlea, and ſemicircular canals.

a, The malleus. b, Incus with its long leg, reſting upon the ſtapes. c, Membrana tympani. d, e, The Euſtachian tube, covered by part of—f f, The muſculus circumflexus palati. 1, 2, 3, The three ſemicircular canals. 4, The veſtible. 5, The cochlea. 6, The portio mollis of the ſeventh pair of nerves.

Fig. 10. Shows the muſcles which compoſe the fleſhy ſubſtance of the Tongue.

a a, The tip of the tongue, with ſome of the papillæ minimæ. b, The root of the tongue. c, Part of the membrane of the tongue, which covered the epiglottis. d d, Part of the muſculus hyo-gloſſus. e, The lingualis. f, Genio-gloſſus. g g, Part of the ſtylo-gloſſus.

Anaxagoras.

Anatomy of Plants. See Plants.

Anatomy of Brutes. See *Comparative Anatomy.*

ANAXAGORAS, one of the moſt celebrated philoſophers of antiquity, was born at Clazomene in Ionia, about the 70th Olympiad. He was a diſciple of Anaximenes; and gave up his patrimony, to be more at leiſure for the ſtudy of philoſophy. He went firſt to Athens, and there taught eloquence; after which, having put himſelf under the tuition of Anaximenes, he gave leſſons on philoſophy in the ſame city. Theſe he only gave to ſome particular friends and diſciples, and with extreme caution. This, however, did not prevent, but rather was the cauſe of, his being accuſed of impiety, and thrown into priſon, notwithſtanding the credit and influence of Pericles, who was his diſciple and intimate. Having been condemned to exile, he calmly yielded to the efforts of envy, and opened ſchool at Lampſacum, where he was extremely honoured during the remainder of his life, and ſtill more after his death, having had ſtatues erected to his memory. He is ſaid to have made ſome predictions relative to the phenomena of nature, upon which he wrote ſome treatiſes. His principal tenets may be reduced to the following:—All things were in the beginning confuſedly placed together, without order and without motion. The principle of things is at the ſame time one and multiplex, which obtained the name of *homœmeries*, or ſimilar particles, deprived of life. But there is beſides this, from all eternity, another principle, namely, an infinite and incorporeal ſpirit, who gave theſe particles a motion; in virtue of which, ſuch as are homogeneal united, and ſuch as were heterogeneal ſeparated, according to their different kinds. In this manner all things being put in motion by the ſpirit, and ſimilar things being united to ſuch as were ſimilar, ſuch as had a circular motion produced heavenly bodies, the lighter particles aſcended, thoſe which were heavy deſcended. The rocks of the earth, being drawn up by the force of the air, took fire, and became ſtars, beneath which the ſun and moon took their ſtations. Thus he did not look upon the ſtars as divinities.

Anaxarchus ‖ Anaximenes.

ANAXARCHUS, a philoſopher of Abdera, highly eſteemed by Alexander the Great. His end was peculiarly tragical: having the misfortune to fall into the hands of the enemy, they pounded him alive in a mortar.

ANAXIMANDER, a famous Greek philoſopher, born at Miletus in the 42d Olympiad, in the time of Polycrates tyrant of Samos. He was the firſt who publicly taught philoſophy, and wrote upon philoſophical ſubjects. He carried his reſearches into nature very far for the time in which he lived. It is ſaid, that he diſcovered the obliquity of the Zodiac, was the firſt who publiſhed a geographical table, invented the gnomen, and ſet up the firſt ſun-dial in an open place at Lacedæmon. He taught, that infinity of things was the principal and univerſal element; that this infinity always preſerved its unity, but that its parts underwent changes; that all things came from it; and that all were about to return into it. According to all appearance, he meant by this obſcure and indeterminate principle the chaos of the other philoſophers. He aſſerted, that there are an infinity of worlds; that the ſtars are compoſed of air and fire, which are carried in their ſpheres, and that theſe ſpheres are gods; and that the earth is placed in the midſt of the univerſe, as in a common centre. He added, that infinite worlds were the product of infinity, and that corruption proceeded from ſeparation.

ANAXIMENES, born at Miletus, an eminent Greek philoſopher, friend, ſcholar, and ſucceſſor of Anaximander. He diffuſed ſome degree of light upon the obſcurity of his maſter's ſyſtem. He made the firſt principle of things to conſiſt in the air, which he conſidered as immenſe or infinite, and to which he aſcribed a perpetual motion. He aſſerted, that all things which proceeded from it were definite and circumſcribed; and that this air, therefore, was God, ſince the divine power reſided in it and agitated it. Coldneſs and moiſture, heat and motion, rendered it viſible, and dreſſed it in different forms, according to the different degrees of its condenſation. All the elements thus proceed from heat and cold. The earth was, in his opinion, one continued flat ſurface.

ANAXIMENES, the ſon of Ariſtocles of Lampſacus, an orator, the diſciple of Diogenes the Cynic, and of Zoilus the railer againſt Homer. He was preceptor to Alexander of Macedon, and followed him to the wars. Alexander being incenſed againſt the people of Lampſacus, they ſent this philoſopher to intercede for them. Alexander knowing the cauſe of his coming, ſwore that he would do the very reverſe of whatever he deſired of him. Anaximenes begged of him to deſtroy Lampſacus. Alexander, unwilling to break his oath, and not able to elude the ſtratagem, pardoned Lampſacus much againſt his will.

ANAXIMANDRIANS, in the hiſtory of philoſophy, the followers of Anaximander; the moſt ancient of the philoſophical atheiſts, who admitted of no other ſubſtance in nature but matter.

ANAZARBUS (Pliny), ANAZARBA (Stephanus); a town of Cilicia, on the river Pyramus, the birth place of Dioſcorides, and of the poet Oppian. It was ſometimes called *Cæſarea*, in honour either of Auguſtus or Tiberius. The inhabitants are called *Anazarbeni* (Pliny), and in coins *Anazarbeis*, after the Greek idiom. It was deſtroyed by a dreadful earthquake in the year 525, along with ſeveral other important cities: but they were all repaired at a vaſt expence by the emperor Juſtin; who was ſo much affected with their misfortune, that, putting off the diadem and purple, he appeared for ſeveral days in ſackcloth.

ANBERTKEND, in the eaſtern language, a celebrated book of the Brachmans, wherein the Indian philoſophy and religion are contained. The word in its literal ſenſe denotes the ciſtern wherein is the water of life. The anbertkend is divided into 50 beths, or diſcourſes, each of which conſiſts of ten chapters. It has been tranſlated from the original Indian into Arabic, under the title of *Morat al Maani*, q. d. *the marrow of intelligence*.

ANCARANO, a town of Italy, in the march of Ancona, ſituated in E. Long. 14. 54. N. Lat. 42. 48.

ANCASTER, a town of Lincolnſhire, ſituated in W. Long. 30. N. Lat. 52. 30. It gives title of duke to the noble family of Bertie.

ANCENIS, a town of France, in the province of Britany. W. Long. 1. 9. N. Lat. 47. 20.

ANCESTORS, thoſe from whom a perſon is deſcended in a ſtraight line. The word is derived from the Latin *anceſſor*, contracted from *anteceſſor*, q. d. *goer before*.

Moſt nations have paid honours to their anceſtors. It was properly the departed ſouls of their forefathers that the Romans worſhipped under the denominations of *lares*, *lemures*, and *houſehold gods*. Hence the ancient tombs were a kind of temples, or rather altars, wherein oblations were made by the kindred of the deceaſed.

The Ruſſians have ſtill their anniverſary feaſts in memory of their anceſtors, which they call *roditoli ſabot*, q. d. *kinsfolk's ſabbath*, wherein they make formal viſits to the dead in their graves, and carry them proviſions, eatables, and preſents of divers other kinds. They interrogate them, with loud lamentable cries, What they are doing? How they ſpend their time? What it is they want? and the like.

The Quojas, a people of Africa, offer ſacrifices of rice and wine to their anceſtors before ever they undertake any conſiderable action. The anniverſaries of their deaths are always kept by their families with great ſolemnity. The king invokes the ſoul of his father and mother to make trade flouriſh and the chace ſucceed.

The Chineſe ſeem to have diſtinguiſhed themſelves above all other nations in the veneration they bear their anceſtors. By the laws of Confucius, part of the duty which children owe their parents conſiſts in worſhipping them when dead. This ſervice, which makes a conſiderable part of the natural religion of the Chineſe, is ſaid to have been inſtituted by the emperor Kun, the fifth in order from the foundation of that ancient empire. Bibl. Un. tom. vii. The Chineſe have both a ſolemn and ordinary worſhip which they pay their anceſtors. The former is held regularly twice a-year, viz. in ſpring and autumn, with much pomp. A perſon who was preſent at it gives the following account of the ceremonies on that occaſion: The ſacrifices were made in a chapel well adorned, where there were ſix altars furniſhed with cenſers, tapers, and flowers. There were three miniſters, and behind them two young acolites. The three former went with a profound ſilence, and frequent genuflexions, towards the five altars, pouring out wine: afterwards they drew near to the ſixth, and when they came to the foot of the altar, half bowed down, they ſaid their prayers with a low voice. That being finiſhed, the three miniſters went to the altar, the officiating prieſt took up a veſſel full of wine, and drank; then he lifted up the head of a deer or goat; after which, taking fire from the altar, they all lighted a bit of paper; and the miniſter of the ceremonies turning towards the people, ſaid with a high voice, that he gave them thanks in the name of their anceſtors for having ſo well honoured them; and in recompence he promiſed them, on their part, a plentiful harveſt, a fruitful iſſue, good health, and long life, and all thoſe advantages that are moſt pleaſing to men.

The Chineſe give their anceſtors another ſimpler and more private worſhip. To this end they have in their houſes a niche or hollow place, where they put the names of their deceaſed fathers, and make prayers and offerings of perfumes and ſpices to them at certain times, with bowing, &c. They do the like at their tombs.

The Jews ſettled in China are ſaid to worſhip their anceſtors like the heathens, and with the ſame ceremonies, except that they offer not ſwine's fleſh. Near their ſynagogue they have a hall, or court of anceſtors, wherein are niches for Abraham, Iſaac, &c. The Jeſuits alſo conformed, and were permitted by their general to conform to this and many other ſuperſtitious cuſtoms of the Chineſe.

There is one peculiarity of another kind, wherein the Chineſe ſhow their regard for their anceſtors: in proportion as any of their deſcendants are preferred to a higher degree of dignity, their dead anceſtors are at the ſame time preferred and ennobled with them. The kings Ven, Van, Veu, Van, and Cheu, Cum, who were deſcended from vaſſal kings, when they mounted the imperial throne, raiſed their anceſtors from the vaſſal or depending ſtate wherein theſe had lived, to the dignity of emperors; ſo that the ſame honours were for the future rendered them as if they had been emperors of China. The ſame example was followed by the ſubſequent kings, and now obtains among the grandees and literati; all now worſhip their anceſtors, according to the rank which they themſelves hold in the world. If the ſon be a mandarin and the father only a doctor, the latter is buried as a doctor, but ſacrificed to as a mandarin. The like holds in degradations, where the condition of the fathers is that of their ſons.

ANCHILOPS, *αγκυλη*, *contraction*, and *ωψ*, *eye*; in medicine, denotes an abſceſs, or collection of matter, between the great angle of the eye and the noſe. If ſuffered to remain too long, or unſkilfully managed, it degenerates, the ſtagnating humours corrupt, and an ulcer is produced. When the tumor is broke, and the tears flow involuntarily, whilſt the os lachrymale is not carious, it is an *ægylops*; but when the ulcer is of a long ſtanding, deep, fetid, and the os lachrymale becomes carious, it is a *fiſtula*. The cure is by reſtriction and exciſion, tying it at the root on the glandula lachrymalis, and, when ready, cutting it off. See SURGERY-*Index*.

ANCHISES, in fabulous hiſtory, a Trojan prince, deſcended from Dardanus, and the ſon of Capys. Venus made love to him in the form of a beautiful nymph; and bore him Æneas, the hero of Virgil's Æneid.

ANCHOR (*anchora*, Lat. from *αγκυρα*, Greek), a heavy, ſtrong, crooked inſtrument of iron, dropped from a ſhip into the bottom of the water, to retain her in a convenient ſtation in a harbour, road, or river.

The moſt ancient anchors are ſaid to have been of ſtone; and ſometimes of wood, to which a great quantity of lead was uſually fixed. In ſome places, baſkets full of ſtones, and ſacks filled with ſand, were employed for the ſame uſe. All theſe were let down by cords into the ſea, and by their weight ſtayed the courſe of the ſhip. Afterwards they were compoſed of iron, and furniſhed with teeth, which, being faſtened to the bottom of the ſea, preſerved the veſſel immoveable; whence *οδοντης* and *dentes* are frequently taken for anchors in the Greek and Latin poets. At firſt there was only one tooth, whence anchors were called *ετεροςομοι*: but in a ſhort time the ſecond was added by Eupalamus, or Anacharſis, the Scythian philoſopher. The anchors with two teeth were called *αμφιβολοι*, or *αμφιςομοι*; and from ancient monuments appear to have been much the ſame with thoſe uſed in our days, only the tranſverſe piece of wood upon their handles (the ſtock) is wanting in all of them. Every ſhip had ſeveral anchors; one of which, ſurpaſſing all the reſt in bigneſs and ſtrength, was peculiarly termed *ιερα* or *ſacra*, and was never uſed but in extreme danger; whence *ſacram anchoram ſolvere*, is proverbially applied to ſuch as are forced to their laſt refuge.

The anchors now made are contrived ſo as to ſink into the ground as ſoon as they reach it, and to hold a great ſtrain before they can be looſened or diſlodged from their ſtation. They are compoſed of a ſhank, a ſtock, a ring, and two arms with their flukes. The ſtock, which is a long piece of timber fixed acroſs the ſhank, ſerves to guide the flukes in a direction perpendicular to the ſurface of the ground; ſo that one of them ſinks into it by its own weight as ſoon as it falls, and is ſtill preſerved ſteadily in that poſition by the ſtock, which, together with the ſhank, lies flat on the bottom. In this ſituation it muſt neceſſarily ſuſtain a great effort before it can be dragged through the earth horizontally. Indeed this can only be effected by the violence of the wind or tide, or both of them, ſometimes increaſed by the turbulence of the ſea, and acting upon the ſhip ſo as to ſtretch the cable to its utmoſt tenſion, which accordingly may diſlodge the anchor from its bed, eſpecially if the ground be ſoft and oozy, or rocky. When the anchor is thus diſplaced, it is ſaid, in the ſea-phraſe, to *come home*.

Plate XXXI. fig. 1. n° 1.

That the figure of this uſeful inſtrument may be more clearly underſtood, let us ſuppoſe a long maſſy beam of iron erected perpendicularly, *b*, at the lower end of which are two arms, *d e*, of equal thickneſs with the beam (uſually called the *ſhank*), only that they taper towards the points, which are elevated above the horizontal plane at an angle of 30 degrees, or inclined to the ſhank at an angle of 60 degrees; on the upper part of each arm, (in this poſition) is a fluke or thick plate of iron, *g h*, commonly ſhaped like an iſoſceles triangle whoſe baſe reaches inwards to the middle of the arm. On the upper end of the ſhank is fixed the ſtock tranſverſely with the flukes; the ſtock is a long beam of oak, *f*, in two parts, ſtrongly bolted, and hooped together with iron rings. See alſo N° 2. Cloſe above the ſtock is the ring *a*, to which the cable is faſtened, or *bent*: the ring is curiouſly covered with a number of pieces of ſhort rope, which are twiſted about it ſo as to form a very thick texture or covering called the *puddening*, and uſed to preſerve the cable from being fretted or chafed by the iron.

Every ſhip has, or ought to have, three principal anchors, with a cable to each, viz. the ſheet, *maitreſſe-anchre*, (which is the *anchora ſacra* of the ancients); the beſt bower, *ſecond ancre*; and ſmall bower, *ancre d' affourche*, ſo called from their uſual ſituation on the ſhip's bows. There are beſides ſmaller anchors, for removing a ſhip from place to place in a harbour or river, where there may not be room or wind for ſailing; theſe are the ſtream-anchor, *ancre de toue*; the kedge and grappling, *grapine*: this laſt, however, is chiefly deſigned for boats.

Method of Making ANCHORS. The goodneſs of the anchor is a point of great importance. Great care is therefore to be taken, that the metal it is made of be neither too ſoft nor too brittle; the latter rendering it liable to break and the former to ſtraiten.

The ſhank, arms, and flukes, are firſt forged ſeparately; then the hole is made at one end of the ſhank for the ring, which being alſo previouſly forged, is put into the hole of the ſhank, and the two ends ſhut together. After which the arms are ſhut to the ſhank, one after the other, and the anchor is finiſhed.

Proof is made of anchors, by raiſing them to a great height, and then letting them fall again on a kind of iron block placed acroſs for the purpoſe. To try whether the flukes will turn to the bottom and take hold of the ground, they place the anchor on an even ſurface, with the end of one of the flukes, and one of the ends of the ſtock reſting on the ſurface; in caſe the anchor turns, and the point of the fluke riſes upwards, the anchor is good.

In England, France, and Holland, anchors are made of forged iron; but in Spain they are ſometimes made of copper, and likewiſe in ſeveral parts of the South-Sea.

For the proportions of anchors, according to Manwaring, the ſhank is to be thrice the length of one of the flukes, and half the length of the beam. According to Aubin, the length of the anchor is to be four tenths of the greateſt breadth of the ſhip; ſo that the ſhank, *e. gr.* of an anchor in a veſſel 30 feet wide, is to be 12 feet long. When the ſhank is, for inſtance, eight feet long, the two arms are to be ſeven feet long, meaſuring them according to their curvity. As to the degree of curvity given the arms, there is no rule for it; the workmen are here left to their own diſcretion.

The latter writer obſerves, that the anchor of a large heavy veſſel is ſmaller, in proportion, than that of a leſſer and lighter one. The reaſon he gives is, that though the ſea employs an equal force againſt a ſmall veſſel as againſt a great one, ſuppoſing the extent of wood upon which the water acts to be equal in both, yet the little veſſel, by reaſon of its ſuperior lightneſs, does not make ſo much reſiſtance as the greater; the defect whereof muſt be ſupplied by the weight of the anchor.

From theſe, and other hydroſtatic principles, the following table has been formed; wherein is ſhown, by means of the ſhip's breadth within, how many feet the beam or ſhank ought to be long, giving it four-tenths or two-fifths of the ſhip's breadth within: by which proportion might be regulated the length of the other parts of the anchor. In this table is repreſented likewiſe the weight an anchor ought to be for a ſhip from eight feet broad to 45, increaſing by one foot's breadth; ſuppoſing that all anchors are ſimilar, or that their weights are as the cubes of the lengths of the ſhanks.

Breadth of the Veſſel. Feet.	Length of the Anchor. Feet.	Weight. Pounds.
8	$3\frac{1}{5}$	33
9	$3\frac{3}{5}$	47
10	4	64
11	$4\frac{2}{5}$	84
12	$4\frac{4}{5}$	110
13	$5\frac{1}{5}$	140
14	$5\frac{2}{5}$	175
15	6	216
16	$6\frac{2}{5}$	262
17	$6\frac{4}{5}$	314
18	$7\frac{2}{5}$	373
19	$7\frac{3}{5}$	439
20	8	512
21	$8\frac{2}{5}$	592

Breadth of the Veſſel. Feet.	Length of the Anchor. Feet.	Weight. Pounds.
22	$8\frac{4}{5}$	681
23	$9\frac{1}{5}$	778
24	$9\frac{3}{5}$	884
25	10	1000
26	$10\frac{2}{5}$	1124
27	$10\frac{4}{5}$	1259
28	$11\frac{1}{5}$	1405
29	$11\frac{3}{5}$	1562
30	12	1728
31	$12\frac{2}{5}$	1906
32	$12\frac{4}{5}$	2097
33	$13\frac{1}{5}$	2300
34	$13\frac{3}{5}$	2515
35	14	2742
36	$14\frac{2}{5}$	2986
37	$14\frac{4}{5}$	3242
38	$15\frac{1}{5}$	3512
39	$15\frac{3}{5}$	3796
40	16	4096
41	$16\frac{2}{5}$	4426
42	$16\frac{4}{5}$	4742
43	$17\frac{1}{5}$	5088
44	$17\frac{3}{5}$	5451
45	18	5832

M. Bouguer, in his *Traite de Navire*, directs to take the length of the ſhank in inches, and to divide the cube of it by 1160 for the weight. The reaſon is obvious; becauſe the quotient of the cube of 201 inches, which is the length of an anchor weighing 7000 ℔. divided by the weight, is 1160; and therefore, by the rule of three, this will be a common diviſor for the cube of any length, and a ſingle operation will ſuffice.

The ſame author gives the following dimenſions of the ſeveral parts of an anchor. The two arms generally form the arch of a circle, whoſe centre is three-eighths of the ſhank from the vertex, or point where it is fixed to the ſhank; and each arm is equal to the ſame length, or the radius; ſo that the two arms together make an arch of 120 degrees: the flukes are half the length of the arms, and their breadth two-fifths of the ſaid length. With reſpect to the thickneſs, the circumference at the throat, or vertex of the ſhank, is generally made about the fifth part of its length, and the ſmall end two-thirds of the throat; the ſmall end of the arms of the flukes, three-fourths of the circumference of the ſhank at the throat. Theſe dimenſions ſhould be bigger, when the iron is of a bad quality, eſpecially if caſt iron is uſed inſtead of forged iron.

At ANCHOR, the ſituation of a ſhip which rides by her anchor in a road or haven, &c. Plate XXXI. fig. 1. Nº 3. repreſents the fore part of a ſhip as riding in this ſituation. See alſo BUOY-ROPE.

To fiſh the ANCHOR, to draw up the flukes upon the ſhip's ſide after it is catted. See the articles DAVIT and FISH.

To ſteer the Ship to her ANCHOR, is to ſteer the ſhip's head towards the place where the anchor lies when they are heaving the cable into the ſhip; that the cable may thereby enter the hauſe with leſs reſiſtance, and the ſhip advance towards the anchor with greater facility.

Anchor-Ground is a bottom which is neither too deep, too ſhallow, nor rocky ; as in the firſt the cable bears too nearly perpendicular, and is thereby apt to jerk the anchor out of the ground ; in the ſecond, the ſhip's bottom is apt to ſtrike at low water, or when the ſea runs high, by which ſhe is expoſed to the danger of ſinking ; and in the third, the anchor is liable to hook the broken and pointed ends of rocks, and tear away its flukes, whilſt the cable, from the ſame cauſe, is conſtantly in danger of being cut through as it rubs on their edges.

ANCHORS, in architecture, is a ſort of carving, ſomewhat reſembling an anchor. It is commonly placed as part of the enrichments of the boultins of capitals of the Tuſcan, Doric, and Ionic orders, and alſo of the boultins of bed-mouldings of the Doric, Ionic, and Corinthian cornices, anchors and eggs being carved alternately through the whole building.

ANCHOR, in heraldry, are emblems of hope, and are taken for ſuch in a ſpiritual as well as a temporal ſenſe.

ANCHORAGE, in law, is a duty upon ſhips for the uſe of the port or harbour where they caſt anchor.

ANCHOVY, in ichthyology, the Engliſh name of the clupea encraſicolus. See CLUPEA.

ANCHOVY-PEAR. See GRIAS.

ANCHUSA, ALKANET or BUGLOSS: A genus of the monogynia order, belonging to the pentandria claſs of plants ; and in the natural method ranking under the 41ſt order, *Aſperifoliæ*. The *calyx* is a quinquepartite perianthium, oblong and perſiſtent: The *corolla* is monopetalous and funnel-ſhaped, the throat cloſed with ſcales: The *ſtamina* conſiſt of five ſhort filaments ; the antheræ oblong and covered: The *piſtillum* has four germina, a filiform ſtylus, and obtuſe ſtigma: There is no *pericarpium*, the calyx containing the ſeed in its boſom: The *ſeeds* are four, oblong, gibbous, and engraven at the baſe.

Species. 1. The officinalis, or greater garden-bugloſs, is a native of France and of the warmer parts of Europe, but will thrive well enough in the climate of Britain ; though the roots ſeldom continue longer than two years there, unleſs they happen to grow in rubbiſh, or out of an old wall, where they will live three or four years. 2. The anguſtifolia, or perennial wild borage, grows to the height of two feet when cultivated in gardens; but in thoſe places where it grows wild is ſeldom more than a foot and an half high. The leaves of this ſort are narrow ; the ſpikes of flowers come out double, and have no leaves about them ; the flowers are ſmall, and of a red colour. The roots will continue two years in a poor ſoil. 3. The undulata, or Portugal bugloſs, is a biennial plant, which grows to the height of two feet, and ſends out many lateral branches. The flowers are of a bright blue colour, and grow in an imbricated ſpike. 4. The orientalis, or eaſtern bugloſs, is a native of the Levant. It is a perennial plant, with long trailing branches which lie on the ground. The flowers are yellow, and about the ſize of the common bugloſs, and there is a ſucceſſion of theſe on the ſame plants great part of the year. 5. The virginiana, or puccoon, grows naturally in the woods of North-America ; and being an early plant, generally flowers before the new leaves come out on the trees ; ſo that in ſome woods where it abounds, the ground ſeems entirely covered with its yellow flowers. It is a perennial plant, which ſeldom riſes a foot high in good ground, but not above half that height where the ſoil is poor. The flowers grow in looſe ſpikes upon ſmooth ſtalks. 6. The ſempervirens, or ever-green borage, is a very hardy perennial plant, with weak trailing branches. It grows naturally in ſome parts of Britain and Spain. The flowers are blue, and come out between the leaves on the ſpike, like the fourth ſort. They appear during a great part of the year. 7. The cretica, or warted bugloſs of Crete, is a low trailing annual plant, whoſe branches ſeldom extend more than ſix inches. The flowers are ſmall, of a bright blue colour, and are collected into ſmall bunches at the extremity of the branches. The plants periſh ſoon after their ſeeds are ripe. 8. The tinctoria, or true alkanet, grows naturally in the Levant. The flowers grow in long ſpikes, coming out *imbricatim*, like the tiles of a houſe.

Culture. All the ſpecies of anchuſa may be propagated by ſeeds; which ſhould be ſown, either in the ſpring or autumn, upon a bed of light ſandy earth ; and when the plants are ſtrong enough to be removed, they muſt be planted on beds at two feet diſtance from one another, and watered, if the ſeaſon requires it, till they have taken root; after which they will require no other care than to keep them free from weeds.

Medicinal Uſes, &c. The flowers of the firſt ſpecies have obtained the name of *cordial* flowers ; to which they have no other title than that they moderately cool and ſoften, without offending, the palate or ſtomach ; and thus, in warm climates, or in hot diſeaſes, may in ſome meaſure refreſh the patient. The root of the tinctoria is likewiſe uſed, not as poſſeſſed of any medicinal virtue, but on account of its imparting an elegant red colour to oily ſubſtances; ſo is frequently directed as a colouring ingredient for ointments, plaſters, &c. As the colour is confined to the cortical part, the ſmall roots are to be preferred, as having proportionably more bark than the large ones. The alkanet root which grows in England is greatly inferior to what comes from France, and ſome other parts of Europe.

ANCHYLOBLEPHARON. See ANCYLOBLEPHARON.

ANCHYLOPS. See ANCHILOPS.

ANCHYLOSIS. See ANCYLOSIS.

ANCIENT, or ANTIENT, a term applied to things which exiſted long ago ; thus we ſay, ancient nations, ancient cuſtoms, &c. See ANTIQUITIES.

ANCIENT, ſometimes denotes elderly, or of long ſtanding, in oppoſition to young, or new ; thus we ſay, an ancient barriſter, ancient buildings.

ANCIENT, in a military ſenſe, denotes either the enſign or colours.

ANCIENT, in ſhips of war, the ſtreamer or flag borne in the ſtern.

ANCIENT DEMESNE, in Engliſh law, is a tenure, whereby all manors belonging to the crown in William the Conqueror's and St Edward's time were held. The numbers, names, &c. hereof were entered by the Conqueror, in a book called *Domeſday Book*, yet remaining in the Exchequer; ſo that ſuch lands as by that book appeared to have belonged to the crown at that time, are called *ancient demeſne*.—The tenants in ancient demeſne are of two ſorts; one who hold their lands frankly by charter; the other by copy of court-roll, or by the verge, at the will of the lord, according to the cuſtom of the manor.—The advantages of this tenure are, 1. That tenants holding by charter cannot be rightfully impleaded out of their manor; and, when they are, they may abate the writ, by pleading the tenure. 2. They are free from toll for all things relating to their livelihood and huſbandry; nor can be impannelled on any inqueſt.—Theſe tenants held originally by plowing the king's land, plaſhing his hedges, and the like ſervice, for the maintenance of his houſehold; and it was on this account that ſuch liberties were given them, for which they may have writs of *monſtraverunt* to ſuch as take the duties of toll, &c.—No lands are to be accounted ancient demeſne, but ſuch as are held in ſocage. Whether land be ancient demeſne or not, ſhall be tried by the Book of Domesday.

ANCIENTY, in ſome ancient ſtatutes, is uſed for elderſhip or ſeniority. The elder ſiſter can demand no more than her other ſiſters, beſide the chief meſne, by reaſon of her ancienty. This word is uſed in the ſtatute of Ireland, 14 Hen. III.

ANCILLON (David), a miniſter of the reformed church at Metz, where he was born the 17th of March 1617. He ſtudied from the ninth or tenth year of his age in the Jeſuits college, where he gave ſuch proofs of his genius, that the heads of the ſociety tried every means to draw him over to their religion and party; but he continued firm againſt their attacks. He went to Geneva in 1623; and ſtudied divinity under Spanheim, Diodati, and Tronchin, who conceived a very great eſteem for him. He left Geneva in April 1641, and offered himſelf to the ſynod of Charenton in order to take upon him the office of a miniſter: his abilities were greatly admired by the examiners, and the whole aſſembly were ſo highly pleaſed with him, that they gave him the church of Meaux, the moſt conſiderable then unprovided for. Here he acquired a vaſt reputation for his learning, eloquence, and virtue, and was even highly reſpected by thoſe of the Roman-catholic communion. He returned to his own country in the year 1653, where he remained till the revocation of the edict of Nantes in 1685. He retired to Francfort after this fatal blow; and having preached in the French church at Hanau, the whole congregation were ſo edified by it, that they immediately called together the heads of the families, in order to propoſe that he might be invited to accept of being miniſter there. The propoſition was agreed to; and he began the exerciſe of his miniſtry in that church about the end of the year 1685. His preaching made ſo great a noiſe at Hanau, that the profeſſors of divinity, and the German and Dutch miniſters, attended his ſermons frequently: the count of Hanau himſelf, who had never before been ſeen in the French church, came hither to hear Mr Ancillon: they came from the neighbouring parts, and even from Francfort; people who underſtood nothing of French flocked together with great eagerneſs, and ſaid they loved to ſee him ſpeak. This occaſioned a great jealouſy in the two other miniſters; which tended to make his ſituation uneaſy. He therefore went to Berlin; where he met with a kind reception from his highneſs the elector, and was made miniſter of the city. Here he had the pleaſure of ſeeing his eldeſt ſon made judge and director of the French in the ſame city, and his other ſon rewarded with a penſion and entertained at the univerſity of Francfort upon the Oder. He had likewiſe the ſatisfaction of ſeeing his brother made judge of all the French in the ſtates of Brandenburgh; and Mr Cayart, his ſon-in-law, engineer to his electoral highneſs. He enjoyed theſe agreeable circumſtances, and ſeveral others, till his death, which happened at Berlin the 3d of September, 1692, when he was 75 years of age.—Mr Ancillon having got a conſiderable fortune by marriage, was enabled thereby to gratify his paſſion for books; his library was accordingly very curious and large, and he increaſed it every day with all that appeared new and important in the republic of letters, ſo that at laſt it was one of the nobleſt collections in the hands of any private perſon in the kingdom. He publiſhed a book, in quarto, in which the whole diſpute concerning Traditions is fully examined: he alſo wrote an apology for Luther, Zuinglius, Calvin, and Beza, and ſeveral other pieces.

ANCLAM, a ſtrong town of Germany, in the circle of Upper Saxony, and duchy of Pomerania, remarkable for its excellent paſtures. It is ſeated on the river Pene. E. Long. 14. 5. N. Lat. 54. 10.

ANCLE, or Ankle. See Ankle.

ANCONA (marquiſate of), a province in the pope's territories in Italy. It lies between the gulph of Venice and mount Appenine, which bound it on the north; Abruzzo on the eaſt; the duchy of Spoletto, and that of Urbino, on the weſt. The air is indifferent; but the ſoil is fruitful, particularly in hemp and flax; and there is great plenty of wax and honey. It contains ſeveral large towns, as Fermo, Loretto, Recanati, Macerata, Jeſi, Tolentino, Aſcoli, Oſimo, St Severino, Monte Alto, Gamerino, and Ripatranſone, which are all archiepiſcopal or epiſcopal ſees.

Ancona, a ſea-port town of Italy, the capital of the marquiſate of that name, and the ſee of a biſhop. It was formerly the fineſt port in all Italy, being built by the emperor Trajan, about the year 115; but was almoſt ruined, and its trade loſt: however, it has again begun to revive. Its harbour is the beſt in all the pope's dominions. The town lies round it on two hills; one of which is at the point of Cape St Syriaco, from whence there is a delightful proſpect. On the other ſtands the citadel, which commands the town and harbour. The ſtreets of this city are narrow and uneven; and the public and private buildings inferior to thoſe of the other great towns in Italy. The cathedral is a low dark ſtructure; and though the front is covered with fine marble, the architecture has neither beauty nor regularity. The church of St Dominic, and that of the Franciſcans, have each an excellent picture of Titian. The exchange, where the merchants meet, is a handſome ſquare portico, in which is an equeſtrian ſtatue of Trajan, who firſt built the port. At the four corners are four other ſtatues. The triumphal arch of Trajan remains almoſt entire, with its inſcription. The common people in this town are a little particular and fantaſtical in their dreſs, but the better ſort follow the French mode. It is a great thoroughfare from the north of Italy to Loretto; which renders proviſions very dear. The tide does not riſe here above a foot, and near the Mediterranean it is ſcarce viſible. E. Long. 15. 5. N. Lat. 43. 36.

ANCONES, in architecture, the corners or quoins of walls, croſs-beams, or rafters.—Vitruvius calls the *conſoles* by the ſame name.

ANCONY, in the iron-works, a piece of half-wrought iron, of about three quarters of 100 weight, and of the ſhape of a bar in the middle, but rude and unwrought at the ends. The proceſs for bringing the iron to this ſtate is this: They firſt melt off a piece from a ſow of caſt iron of the proper ſize; this they hammer at the forge into a maſs of two feet long, and of a ſquare ſhape, which they call a *bloom*; when this is done, they ſend it to the finery; where, after two or three heats and workings, they bring it to this figure, and call it an *ancony*. The middle part beat out at the finery, is about three feet long, and of the ſhape and thickneſs the whole is to be; this is then ſent to the chafery, and there the ends are wrought to the ſhape of the middle, and the whole made into a bar. See BAR.

ANCORARUM URBES, Ανκυρων Πολις, a city in the Nomos Aphroditopolites, towards the Red Sea; ſo called becauſe there was in the neighbourhood a ſtone quarry, in which they hewed ſtone anchors (Ptolemy) before iron anchors came to be uſed. The gentilitious name is *Ancyropolites*, (Stephanus).

ANCOURT (Florent-Carton d'), an eminent French actor and dramatic writer, born at Fontainbleau, October 1661. He ſtudied in the Jeſuits' college at Paris, under father de la Rue: who, diſcovering in him a remarkable vivacity and capacity for learning, was extremely deſirous of engaging him in their order; but Ancourt's averſion to a religious life rendered all his efforts ineffectual. After he had gone through a courſe of philoſophy, he applied himſelf to the civil law, and was admitted advocate at 17 years of age. But falling in love with an actreſs, he was induced to go upon the ſtage, and he married her. As he had all the qualifications neceſſary for the theatre, he ſoon greatly diſtinguiſhed himſelf: and not being ſatisfied with the applauſe only of an actor, he began to write pieces for the ſtage; many of which had ſuch prodigious ſucceſs, that moſt of the players grew rich from the profits of them. His merit in this way procured him a very favourable reception at court; and Lewis XIV. ſhowed him many marks of his favour. His ſprightly converſation and polite behaviour made his company agreeable to all the men of figure both at court and in the city, and the moſt conſiderable perſons were extremely pleaſed to have him at their houſes. Having taken a journey to Dunkirk, to ſee his eldeſt daughter who lived there, he took the opportunity of paying his compliments to the elector of Bavaria, who was then at Bruſſels: this prince received him with the utmoſt civility; and having detained him a conſiderable time, diſmiſſed him with a preſent of a diamond valued at 1000 piſtoles: he likewiſe rewarded him in a very generous manner, when, upon his coming to Paris, Ancourt compoſed an entertainment for his diverſion. Ancourt began at length to grow weary of the theatre, which he quitted in Lent 1718, and retired to his eſtate of Courcelles le Roy, in Berry, where he applied himſelf wholly to devotion, and compoſed a tranſlation of David's Pſalms in verſe, and a ſacred tragedy, which were never printed. He died the 6th of December, 1726, being 65 years of age.—The plays which he wrote are 52 in all; moſt of which were printed ſeparately at the time when they were firſt repreſented; they were afterwards collected into five volumes, then into ſeven, and at laſt into nine. This laſt edition is the moſt complete.

ANCRE, a ſmall town of France, in Picardy, with the title of a marquiſate, ſeated on a little river of the ſame name. E. Long. 2. 45. N. Lat. 49. 59.

ANCUS MARTIUS, the fourth king of the Romans, ſucceeded by Tullius Hoſtilius, 639 years before Chriſt. He defeated the Latins, ſubdued the Fidenates, conquered the Sabines, Volſcii, and Veientines, enlarged Rome by joining to it mount Janicula, and made the harbour of Oſtia. He died about 615 years before the Chriſtian æra.

ANCYLE, in antiquity, a kind of ſhield that fell, as was pretended, from heaven, in the reign of Numa Pompilius; at which time, likewiſe, a voice was heard declaring that Rome ſhould be miſtreſs of the world as long as ſhe ſhould preſerve this holy buckler. It was kept with great care in the temple of Mars, under the direction of twelve prieſts; and leaſt any ſhould attempt to ſteal it, eleven others were made ſo like, as not to be diſtinguiſhed from the ſacred one. Theſe ancylia were carried in proceſſion every year round the city of Rome.

ANCYLE, in ſurgery. See ANCYLOSIS.

ANCYLOBLEPHARON, (from αγκυλος *bent* and βλεφαρον *an eye-lid*); a diſeaſe of the eye, which cloſes the eye-lids. Sometimes the eye-lids grow together, and alſo to the tunica albuginea of the eye, from careleſſneſs when there is an ulcer in theſe parts. Both theſe caſes are called *ancyloblepharon* by the Greeks. This diſorder muſt be diſtinguiſhed from that coalition of the eye-lids which happens from viſcid matter gluing them together. If the coheſion is on the cornea, the ſight is inevitably loſt. This hath ſometimes happened in the ſmall-pox. If there is only a growing together of the eye-lids, they may be ſeparated with the ſpecillum, and pledgets kept between them to prevent their re-union. If the eye-lids adhere to the eye, they are to be ſeparated by a fine-edged knife; and their re-union is to be prevented by a proper uſe of injections, and lint placed between them, after dipping it in ſome proper liniment.

ANCYLOGLOSSUM, (from αγκυλος *crooked* and γλωσσα *the tongue*); a contraction of the ligaments of the tongue. Some have this imperfection from their birth, others from ſome diſeaſe. In the firſt caſe, the membrane which ſupports the tongue is too ſhort or too hard; in the latter, an ulcer under the tongue, healing and forming a cicatrix, is ſometimes the cauſe: Theſe ſpeak with ſome difficulty. The ancylogloſſi by nature are late before they ſpeak: but when they begin, they ſoon ſpeak properly. Theſe we call *tongue-tied*. Mauriceau ſays, that in this caſe it is a ſmall membranous production, which extends from the frænulum to the tip of the tongue, that hinders the child from ſucking, &c. He juſtly condemns the cruel practice among nurſes, of tearing this membrane with their nails; for thus ulcers are ſometimes formed, which are of difficult cure : he adviſes to ſnip it with ſciſſars in two or three places, taking care not to extend the points of the ſciſſars ſo far as the frænulum. The inſtances rarely occur which require any kind of aſſiſtance ; for if the child can thruſt the tip of its tongue to the outer edge of its lip, this diſeaſe does not exiſt ; and if the tongue is not greatly reſtrained, the frænulum will ſtretch by the child's ſucking and crying.

ANCYLOSIS, in ſurgery, implies a diſtortion or ſtiffneſs of the joints, cauſed by the ſettlement of the humours, or a diſtenſion of the nerves, and therefore remedies of a mollifying and relaxing nature are required.

ANCYRA, the capital of Galatia, (Livy, Pliny, Ptolemy) ; at no great diſtance from the river Halys, (Livy) : ſaid to be built by Midas, king of Phrygia, and to take its name from an anchor found there, (Pauſanias). It was greatly improved by Auguſtus, deemed the ſecond founder of it, as appears from the *Marmor Ancyranum*. It is now called *Angura*, or *Angoura*. E. Long. 35°. Lat 41. 20.

ANCYSTRUM, in botany : A genus of the digynia order, belonging to the diandria claſs of plants ; the eſſential characters of which are : The *calyx* is a ſingle-leaved, four-toothed perianthium, four-awn'd, the awns terminated with croſs-barbs : The *corolla* is four-cleft ; the ſtigma pencil'd.

ANDABATÆ, in antiquity, a ſort of gladiators, who, mounted on horſeback or in chariots, fought hoodwinked, having a helmet that covered their eyes.

ANDALUSIA, is the moſt weſtern province of Spain, having Eſtramadura and La Mancha on the north ; the kingdom of Granada, the ſtraights of Gibraltar, and the Ocean, on the eaſt and ſouth ; and, on the weſt, the kingdom of Algarva in Portugal, from which it is ſeparated by the river Guadiana. It is about 182 miles long, and 150 broad. The chief cities and towns are Seville the capital, Baeza, Gibraltar, Corduba, Cadiz, Medina, Sidonia, Jaen, Port St Mary, &c. It is the beſt, moſt fruitful, and the richeſt part of all Spain. There is a good air, a ſerene ſky, a fertile ſoil, and a great extent on the ſea-coaſt fit for commerce.

New ANDALUSIA, a diviſion of the province of Terra Firma in South-America, whoſe bonndaries cannot be well aſcertained, as the Spaniards pretend a right to countries in which they have never eſtabliſhed any ſettlements. According to the moſt reaſonable limits, it extends in length 500 miles from north to ſouth, and about 270 in breadth from eaſt to weſt. The interior country is woody and mountainous, variegated with fine valleys that yield corn and paſturage. The produce of the country conſiſts chiefly in dying-drugs, gums, medicinal roots, brazil wood, ſugar, tobacco, and ſome valuable timber. To this province alſo belonged five valuable pearl-fiſheries. The capital of New Andaluſia is Comana, Cumana, or New Corduba, ſituated in N. Lat. 9. 55. about nine miles from the north ſea. Here the Spaniards laid the foundation of a town in the year 1520. The place is ſtrong by nature, and fortified by a caſtle capable of making a vigorous defence ; as appeared in the year 1670, when it was aſſaulted by the buccanneers, who were repulſed with very great ſlaughter.

ANDAMAN or ANDEMAN Iſlands, in the Eaſt Indies, ſituated about 80 leagues diſtance from Tanaſſerim on the coaſt of Siam. They are but little known ; only the Eaſt India ſhips ſometimes touch at them, and are ſupplied by the natives with rice, herbs, and fruits : the inhabitants are by ſome repreſented as an harmleſs inoffenſive race of men, and by others as cannibals. E. Long. 92. 0. N. Lat. from 10°. to 15°.

ANDANTE, in muſic, ſignifies a movement moderately ſlow, between *largo* and *allegro*.

ANDECAVI, (Tacitus) ; ANDEGAVI, (Pliny) ; ANDES, (Cæſar) ; ANDI, (Lucan) : A people of Gallia Celtica, having the Turones to the Eaſt, the Namnetes to the weſt, the Pictones to the ſouth, and the Aulerci Cœnomani to the north : now *Anjou*.

ANDEGAVI, or ANDEGAVUS, a town of Gallia Celtica, (Pliny, Ptolemy) ; now *Angiers*. Called *Andecavi*, (Tacitus). W. Long. 30. Lat. 47. 30.

ANDELY, a town of Normandy in France, parted in two by a paved cauſeway. Here is a fountain to which pilgrims flock from all parts, to be cured of their diſorders, on the feaſt-day of the ſaint to which it is dedicated. It is 20 miles S. E. of Rouen, and five N. W. of Paris. E. Long. 1. 30. N. Lat. 49. 20.

ANDENA, in old writers, denotes the ſwath made in mowing of hay, or as much ground as a man can ſtride over at once.

ANDEOL (St), a town of France, in the Vivarez, five miles S. of St Viviers, whoſe biſhop formerly reſided there. E. Long. 2. 50. N. Lat. 44. 24.

ANDERAB, the moſt ſouthern city of the province of Balkh, poſſeſſed by the Uſbeck Tartars. It is very rich and populous, but a place of no great ſtrength. The neighbouring mountains yield excellent quarries of lapis lazulli, in which the Bukhars drive a great trade with Perſia and India.—This city is ſituated at the foot of the mountains dividing the dominions of the Great Mogul and Perſia from Great Bukharia. As there is no other way of croſſing theſe mountains but by the road through this city, all travellers with goods muſt pay 4 per cent. On this account the Khan of Balkh maintains a good number of ſoldiers in the place.

ANDERNACHT, a city of Cologne, in the circle of the Lower Rhine. It is ſituated in a plain on the river Rhine ; and is fortified with a wall, caſtle, and bulwarks. It has a trade in ſtone jugs and pitchers, which are ſent to the mineral waters at Dunchſtein. There are three monaſteries here and ſeveral churches. E. Long. 7. 4. N. Lat. 50. 27.

ANDERNO (St), a ſea-port town in the bay of Biſcay, in Old Caſtile, ſeated on a ſmall peninſula. It is a trading town, and contains about 700 houſes, two pariſh-churches, and four monaſteries. Here the Spaniards build and lay up ſome of their men of war. W. Long. 4. 30. N. Lat. 43. 20.

ANDERSON (Sir Edmund), a younger ſon of an ancient Scotch family ſettled in Lincolnſhire. He was ſome time a ſtudent of Lincoln college, Oxford ; and removed from thence to the Inner Temple, where he applied himſelf diligently to the ſtudy of the law, and became a barriſter. In the 9th of queen Elizabeth he was both lent and ſummer reader, and in the 17th double reader. He was appointed her majeſty's ſergeant at law in the 19th year of her reign ; and ſome time after, one of the juſtices of aſſize. In 1582 he was made lord chief juſtice of the common pleas, and in the year following was knighted. He held his office to the end of his life, died in the year 1605, and was buried at Eyworth in Bedfordſhire. He was an able, but punctilious lawyer; a ſcourge to the Puritans; and a ſtrenuous ſupporter of the eſtabliſhed church. His works are, 1. Reports of many principal caſes argued and adjudged in the time of queen Elizabeth, in the common bench. Lond. 1664, fol. 2. Reſolutions and judgments on the caſes and matters agitated in all the courts of Weſtminſter, in the latter end of the reign of queen Elizabeth. Publiſhed by John Goldſborough, Eſq; Lond. 1653, 4to. Beſides theſe, there is a manuſcript copy of his Readings ſtill in being.

Anderson (Adam), a native of Scotland, was brother to the reverend James Anderſon, D.D. editor of the *Diplomata Scotiæ* and *Royal Genealogies*, many years ſince miniſter of the Scots preſbyterian church in Swallow-ſtreet, Picadilly, and well known in thoſe days among the people of that perſuaſion reſident in London, by the name of Biſhop Anderſon, a learned but imprudent man, who loſt a conſiderable part of his property in the fatal year 1720. He married, and had iſſue a ſon, and a daughter, who was the wife of an officer in the army.

Adam Anderſon was for 40 years a clerk in the South Sea Houſe; and at length arrived to his acmè there, being appointed chief clerk of the Stock and New Annuities, which office he retained till his death. He was appointed one of the truſtees for eſtabliſhing the colony of Georgia, in America; and was alſo one of the court of aſſiſtants of the Scots corporation in London. The time of the publication of his "Hiſtorical and Chronological Deduction of Trade and Commerce," a work replete with uſeful information, was about the year 1762. He was twice married; by the firſt wife he had iſſue a daughter, married to one Mr Hardy, an apothecary in the Strand, who are both dead without iſſue; he afterwards became the third huſband of the widow of Mr Coulter, formerly a wholeſale linen-draper in Cornhill, by whom he had no iſſue. She was, like him, tall and graceful; and her face has been thought to have ſome reſemblance to that of the ever-living counteſs of Deſmond, given in Mr Pennant's firſt Tour in Scotland. Mr Anderſon died at his houſe in Red Lion-ſtreet, Clerkenwell, January 10, 1775. He had a good library of books, which were ſold by his widow, who ſurvived him ſeveral years, and died in 1781.

ANDES, a great chain of mountains in South America, which, running from the moſt northern part of Peru to the ſtraits of Magellan, between 3 and 4000 miles, are the longeſt and moſt remarkable in the world. The Spaniards call them the *Cordilleras de los Andes;* they form two ridges, the lowermoſt of which is overſpread with woods and groves, and the uppermoſt covered with everlaſting ſnow. Thoſe who have been at the top, affirm, that the ſky is always ſerene and bright; the air cold and piercing; and yet ſo thin, that they were ſcarce able to breathe, and the reſpiration was much thicker than ordinary; and this attended with reaching and vomiting; which, however, has been conſidered by ſome as merely accidental. When they looked downwards, the country was hid by the clouds that hovered on the mountain's ſides. The mountains juſt mentioned, which have been frequently aſcended, are much inferior in height to many others in this enormous chain. The following is the account given of the mountain called *Pichincha*, by the mathematicians ſent by the kings of France and Spain to make obſervations in relation to the figure of the earth.

Soon after our artiſts arrived at Quito, they determined to continue the ſeries of the triangles for meaſuring an arch of the meridian to the S. of that city: the company accordingly divided themſelves into two bodies, conſiſting of French and Spaniards, and each retired to the part aſſigned them. Don George Juan and M. Godin, who were at the head of one party, went to the mountain of Pambamarca; while M. Bougeur, de la Condamine, and Don Ulloa, together with their aſſiſtants, climbed up to the higheſt ſummit of Pichincha. Both parties ſuffered extremely, as well from the ſeverity of the cold as from the impetuoſity of the winds, which on theſe heights blow with inceſſant violence; difficulties the more painful, as they had been little uſed to ſuch ſenſations. Thus, in the torrid zone, nearly under the equinoctial, where it is natural to ſuppoſe they had moſt to fear from the heat, their greateſt pain was cauſed by the exceſſiveneſs of the cold.

Their firſt ſcheme for ſhelter and lodging in theſe uncomfortable regions, was to pitch a field-tent for each company; but on Pichincha this could not be done from the narrowneſs of the ſummit: they were therefore obliged to be contented with a hut ſo ſmall that they all could hardly creep into it. Nor will this appear ſtrange, if the reader conſiders the bad diſpoſition and ſmallneſs of the place, it being one of the loftieſt crags of a rocky mountain, 100 fathoms above the higheſt part of the deſart of Pichincha. Such was the ſituation of their manſion, which, like all the other adjacent parts, ſoon became covered with ice and ſnow. The aſcent up this ſtupendous rock from the baſe, or the place where the mules could come, to their habitation, was ſo craggy as only to be climbed on foot; and to perform it coſt them four hours continual labour and pain, from the violent efforts of the body, and the ſubtility of the air; the latter being ſuch as to render reſpiration difficult.

The ſtrange manner of living to which our artiſts were reduced during the time they were employed in a geometrical menſuration of ſome degrees of the meridian, may not perhaps prove unentertaining to the reader; and therefore the following account is given as a ſpecimen of it. The deſart of Pichincha, both with regard to the operations performed there and its inconveniencies, differing very little from others, an idea may be very eaſily formed of the fatigues, hardſhips, and dangers, to which they were continually expoſed during the time they were proſecuting the enterpriſe, with the conduct of which they had been honoured. The principal difference between the ſeveral deſarts conſiſted in their greater or leſſer diſtance from places where they could procure proviſions; and in the inclemency of the weather, which was proportionate to the height of the mountains, and the ſeaſon of the year.

They generally kept within their hut. Indeed they were obliged to do this, both on account of the intenſeneſs of the cold, the violence of the wind, and their being continually involved in ſo thick a fog, that an object at ſix or eight paces was hardly diſcernible. When the fog cleared up, the clouds by their gravity moved nearer to the ſurface of the earth, and on all ſides ſurrounded the mountains to a vaſt diſtance, repreſenting the ſea, with their rock like an iſland in the centre of it. When this happened they heard the horrid noiſes of the tempeſts, which then diſcharged themſelves on Quito and the neighbouring country. They ſaw the lightnings iſſue from the clouds, and heard the thunders roll far beneath them: and whilſt the lower parts were involved in tempeſts of thunder and rain, they enjoyed a delightful ſerenity; the wind was abated, the ſky clear, and the enlivening rays of the ſun moderated the ſeverity of the cold. But their circumſtances were very different when the clouds roſe: their thickneſs rendered reſpiration difficult; the ſnow and hail fell continually; and the wind returned with all its violence; ſo that it was impoſſible entirely to overcome the fears of being, together with their hut, blown down the precipice, on whoſe edge it was built, or of being buried under it by the daily accumulations of ice and ſnow.

The wind was often ſo violent in theſe regions, that its velocity dazzled the ſight, whilſt their fears were increaſed from the dreadful concuſſions of the precipice, cauſed by the fall of enormous fragments of rocks. Theſe craſhes were the more alarming, as no other noiſes are heard in theſe deſarts: and during the night, their reſt, which they ſo greatly wanted, was frequently diſturbed by ſuch ſudden ſounds. When the weather was any thing fair with them, and the clouds gathered about ſome of the other mountains which had a connection with their obſervations, ſo that they could not make all the uſe they deſired of this interval of good weather, they left their hut to exerciſe themſelves. Sometimes they deſcended to ſome ſmall diſtance; and at others amuſed themſelves with rolling large fragments of rocks down the precipice; and theſe frequently required the joint ſtrength of them all, though they often ſaw the ſame effected by the mere force of the wind. But they always took care in their excurſions not to go ſo far out, but that on the leaſt appearance of the clouds gathering about their cottage, which often happened very ſuddenly, they could regain their ſhelter. The door of their hut was faſtened with thongs of leather, and on the inſide not the ſmalleſt crevice was left unſtopped; beſide which, it was very compactly covered with ſtraw: but, notwithſtanding all their care, the wind penetrated through. The days were often little better than the nights; and all the light they enjoyed was that of a lamp or two, which they kept continually burning.

Though their hut was ſmall, and crowded with inhabitants, beſide the heat of the lamps; yet the intenſeneſs of the cold was ſuch, that every one of them was obliged to have a chafing diſh of coals. Theſe precautions would have rendered the rigour of the climate ſupportable, had not the imminent danger of periſhing by being blown down the precipice rouſed them, every time it ſnowed, to encounter the ſeverity of the outward air, and to ſally out with ſhovels to free the roof of their hut from the maſſes of ſnow which were gathering on it. Nor would it, without this precaution, have been able to ſupport the weight. They were not indeed without ſervants and Indians; but theſe were ſo benumbed with the cold, that it was with great difficulty they could get them out of a ſmall tent, where they kept a continual fire. So that all our artiſts could obtain from them was to take their turns in this labour; and even then they went very unwillingly about it, and conſequently performed it very ſlowly.

It may eaſily be conceived what this company ſuffered from the aſperities of ſuch a climate. Their feet were ſwelled; and ſo tender, that they could not even bear the heat; and walking was attended with extreme pain. Their hands were covered with chilblains; their lips ſwelled and chopped; ſo that every motion in ſpeaking, or the like, drew blood; conſequently they were obliged to ſtrict taciturnity, and little diſpoſed to laugh, as, by cauſing a diſtenſion of the lips, it produced ſuch fiſſures as were very painful for two or three days after.

Their common food in this inhoſpitable region was a little rice boiled with ſome fleſh or fowl, procured from Quito; and, inſtead of fluid water, their pot was filled with ice; they had the ſame reſource with regard to what they drank; and while they were eating, every one was obliged to keep his plate over a chafing-diſh of coals, to prevent his proviſions from freezing. The ſame was done with regard to the water. At firſt they imagined the drinking ſtrong liquors would diffuſe a heat through the body, and conſequently render it leſs ſenſible of the painful ſharpneſs of the cold; but, to their ſurpriſe, they felt no manner of ſtrength in ſuch liquors, nor were they any greater preſervative againſt the cold than the common water.

At the ſame time they found it impoſſible to keep the Indians together. On their firſt feeling of the climate, their thoughts were immediately turned on deſerting their maſters. The firſt inſtance they had of this kind was ſo unexpected, that, had not one, of a better diſpoſition than the reſt, ſtaid and acquainted them of their deſign, it might have proved of very bad conſequence. The affair was this: There being on the top of the rock no room for pitching a tent for the Indians, they uſed every evening to retire to a cave at the foot of the mountain; where, beſide a natural diminution of the cold, they could keep a continual fire; and, conſequently enjoyed more comfortable quarters than their maſters. Before they withdrew at night, they faſtened, on the outſide, the door of the hut, which was ſo low that it was impoſſible to go in or out without ſtooping; and as every night the hail and ſnow which had fallen formed a wall againſt the door, it was the buſineſs of one or two of the Indians to come early and remove this obſtruction. For though the negro ſervants were lodged in a little tent, their hands and feet were ſo covered with chilblains, that they would rather have ſuffered themſelves to have been killed than move. The Indians therefore came conſtantly up to diſpatch this work betwixt nine and ten in the morning: but they had not been there above four or five days, when they were not a little alarmed to ſee ten, eleven, and twelve o'clock come, without any news of their labourers; when they were relieved by the honeſt ſervant mentioned above, who had withſtood the ſeduction of his countrymen, and informed his maſters of the deſertion of the four others. As ſoon as the ſnow was cleared away from the door, they diſpatched the Indian to the corregidor of Quito, who with equal diſpatch ſent other Indians, threatening to chaſtiſe them ſeverely if they were wanting in their duty.

But the fear of puniſhment was not ſufficient to induce them to ſupport the rigour of this ſituation; for within two days they deſerted. The corregidor therefore, to prevent any other inconvenience, ſent four Indians under the care of an alcalde, and gave orders for their being relieved every fourth day.

Twenty-three tedious days our artiſts ſpent on this rock, viz. to the 6th of September, and even without any poſſibility of finiſhing their obſervations of the angles: for when it was fair and clear weather with them, the others, on whoſe ſummits the ſignals which formed the triangles for meaſuring the degrees of the meridian, were hid in the clouds; and when thoſe were clear, Pichincha was involved in clouds. It was therefore neceſſary to erect their ſignals in a lower ſituation, and in a more favourable region. This, however, did not produce any change in their habitation till the beginning of December; when, having finiſhed the obſervations which particularly concerned Pichincha, they proceeded to others; but with no abatement either of inconveniences, cold, or fatigue; for the places where they made their obſervations being neceſſarily on the higheſt parts of the deſarts, the only reſpite in which they enjoyed ſome little eaſe was during the ſhort interval of paſſing from one to the other.

In all their ſtations ſubſequent to that on Pichincha, during their fatiguing menſuration of the degrees of the meridian, each company lodged in a field-tent, which, though ſmall, they found leſs inconvenient than the hut on Pichincha; though at the ſame time they had more trouble, being oftener obliged to clear it from the ſnow, as the weight of it would otherwiſe have demoliſhed the tent. At firſt, indeed, they pitched it in the moſt ſheltered places; but on taking a reſolution that the tents themſelves ſhould ſerve for ſignals, to prevent the inconvenience of having others of wood, they removed them to a more expoſed ſituation, where the impetuoſity of the winds ſometimes tore up the piquets, and blew them down.

Though this mountain is famous for its great height, it is conſiderably lower than the mountain of Cotopaxi: but it is impoſſible to conceive the coldneſs of the ſummit of the laſt-mentioned mountain from that felt on this; ſince it muſt exceed every idea that can be formed by the human mind, tho' they are both ſeated in the midſt of the torrid zone. In all this range of mountains, there is ſaid to be a conſtant inferior boundary, beyond which the ſnow never melts: this boundary, in the midſt of the torrid zone, is ſaid by ſome to be 2434 fathoms above the level of the ſea; by others, only 2400 feet. The ſnow indeed falls much lower, but then it is ſubject to be melted the very ſame day. It is affirmed, that there are in the Andes 16 volcanoes or burning mountains, which throw out fire and ſmoke with a terrible noiſe. The height of Chimborazo, ſaid to be the higheſt peak of the Andes, has been determined by geometrical calculations to be 20,282 feet. But the great differences between the calculators of the height of mountains in other parts of the world, muſt very much diminiſh the credit of ſuch calculations. Inſtances of this we have already given under the article ÆTNA. No leſs remarkable are the differences concerning the height of the peak of Teneriffe; which, according to the calculations of Varenius, is three miles and three quarters, or 19,800 feet; according to thoſe of Dr Heberden, it is only 15,396 feet; and according to thoſe of M. Feuille, is no more than 13,128 feet. From theſe ſpecimens, we can ſcarce avoid concluding, that all the methods hitherto invented for calculating the exact height of mountains are inſufficient.

As all or moſt rivers have their ſource in mountains, it is no wonder a great number run down the ſides of the Andes. Some hurry along with a prodigious rapidity; while others form beautiful caſcades, or run thro' holes in rocks, which look like bridges of a ſtupendous height. There is a public road through the mountains 1000 miles in length, part of which runs from Quito to Cuſco.

ANDES, a hamlet of Mantua in Italy, the birthplace of Virgil. Hence the epithet *Andinus* (Silius Italicus). Now called *Pietola*, two miles to the weſt of Mantua.

ANDETRIUM; ANDRETIUM (Strabo); ANDECRIUM, or ANDRECIUM (Ptolemy): An inland town of Dalmatia. The genuine name is *Andetrium* (Inſcription.) It is deſcribed as ſituated near Salonæ, on a naturally ſtrong and inacceſſible rock, ſurrounded with deep valleys, with rapid torrents; from which it appears to be the citadel now called *Cliſſa*. E. Long. 17. 46. N. Lat. 43. 20.

ANDEUSE, a city of Languedoc in France, ſituated in E. Long. 3. 40. and N. Lat. 43. 45.

ANDOMADUNUM; ANDOMATUNUM (Ptolemy); and ANTEMATUNUM (Antonine); CIVITAS LINGONUM (Tacitus): A city of Gallia Belgica; now *Langres* in Champagne, ſituated on an eminence (which ſeems to juſtify the termination *dunum*), on the borders of Burgundy, at the ſprings of the Marne. Tacitus calls an inhabitant *Lingon*. E. Long. 5. 22. N. Lat. 48. 0.

ANDOVER, a large market town in Hampſhire, on the London road. It is ſeated on a branch of the river Teſt, and ſends two members to parliament. It has ſeveral inns, which afford good accommodations for travellers; and has a market on Saturday, well ſtocked with proviſions. It is governed by a bailiff, a ſteward, a recorder, ten approved men, and twenty-two capital burgeſſes, who yearly chooſe the bailiff, and he elects two ſerjeants at mace to attend him. The living is a vicarage, valued at 171l. 4s. 4d. in the king's books. W. Long. 0. 56. N. Lat. 51. 20.

ANDRADA (Diego de Payva d') or ANDRADIUS, a learned Portugueſe, born at Conimbria, who diſtinguiſhed himſelf at the council of Trent, where king Sebaſtian ſent him as one of his divines. There is ſcarce any Catholic author who has been more quoted by the Proteſtants than he, becauſe he maintained ſome opinions a little extravagant concerning the ſalvation of the Heathens. Andrada was eſteemed an excellent preacher. His ſermons were publiſhed in three parts, the ſecond of which was tranſlated into Spaniſh by Benedict de Alcoran. Many encomiums have been beſtowed upon Andrada. Oſorius, in his preface to the "Orthodox Explanations of Andradius," gives him the character of a man of wit, vaſt application, great knowledge in the languages, with all the zeal and eloquence neceſſary to a good preacher; and Roſweidus ſays, that he brought to the council of Trent the underſtanding of a moſt profound divine, and the eloquence of a conſummate orator.

ANDRACHNE, Bastard Orpine: A genus of the gynandria order, belonging to the monœcia claſs of plants; and in the natural method ranking under the 38th order, *Tricoccæ.* The characters are: The male *calyx* conſiſts of five leaves; the *corolla* has five petals; and the *ſtamina,* which are alſo five in number, are inſerted into the ſtylus: The female *calyx* is divided into five leaves; there is no *corolla;* the *ſtyli* are three; and the *capſule* is trilocular, containing three ſeeds.

Species. 1. The telephoides, or herbaceous trailing andrachne, is a low plant, whoſe branches trail upon the ground. The leaves are ſmall, of an oval ſhape, ſmooth, and of a ſea-green colour. It is found wild in ſome parts of Italy and the Archipelago; but is a plant of no great beauty, and therefore ſeldom cultivated. 2. The fruticoſa, or ſhrubby baſtard orpine, is a native of China and ſome places of America, where it riſes 12 or 14 feet high. The leaves are ſpear-ſhaped, pointed, and ſmooth; and under them are produced the foot-ſtalks of the flowers, which are ſmall, and of a herbaceous white colour. 3. The arborea, with a tree-like ſtalk. This ſpecies was diſcovered by the late Dr William Houſton, growing naturally at Campeachy. It has a ſtrong woody ſtem, which riſes more than 20 feet high, and ſends out many branches on every ſide. A fourth ſort is alſo mentioned by Mr Millar as raiſed by him from ſeeds ſent from Jamaica. It agrees in general with the third ſort; but the leaves are ſomewhat like the laurel, only much larger.

Culture. The firſt ſpecies may be raiſed, by ſowing the ſeeds in March, on a moderate hot-bed. The plants may be removed into ſmall pots, and plunged into another very moderate hot-bed, to bring them forward; but in mild weather they ſhould have plenty of air admitted to them, and be frequently refreſhed with water. In June they will produce flowers, and the ſeeds will ripen in Auguſt and September.—The other ſpecies are very tender, and therefore muſt be kept conſtantly in the bark-ſtove. It is very difficult to procure good ſeeds of theſe ſorts; the covers often containing nothing, though they appear very fair outwardly.

ANDRAPODISMUS, in ancient writers, the ſelling of perſons for ſlaves. Hence alſo *andrapodiſtes,* a dealer in ſlaves, more particularly a kidnapper, who ſteals men or children to ſell them; a crime for which the Theſſalians were noted.

ANDRAPODOCAPELI, in antiquity, a kind of dealers in ſlaves. The *andrapodocapeli* had a particular proceſs for taking off moles and the like disfigurements on the faces of the ſlaves they kept for ſale, by rubbing them with bran. At Athens, ſeveral places in the forum were appointed for the ſale of ſlaves. Upon the firſt day of every month, the merchants called Ανδραποδοκαπηλοι brought them into the market, and expoſed them to ſale; the crier ſtanding upon a ſtone erected for that purpoſe, called the people together.

ANDREA (St), a ſmall village on the Malabar coaſt in the Eaſt-Indies, founded originally by the Portugueſe. It takes its name from a church dedicated to St Andrew, and ſerved by the prieſts of St Thomas.—On the ſhore of St Andrea, about half a league out in the ſea, lies Mud-bay, a place which few in the world can parallel. It is open to the wide ocean, and has neither iſland nor bank to break the force of the billows, which come rolling with great violence from all parts, in the ſouth-weſt monſoons: but on this bank of mud they loſe themſelves in a moment; and ſhips lie on it as ſecure as in the beſt harbour, without motion or diſturbance. It reaches about a mile along ſhore, and has been obſerved to ſhift its place from the northward about three miles in 30 years. From St Andrea to Kranganôr, about 12 leagues to the ſouth, the water has the bad property of cauſing ſwellings in the legs of thoſe who drink it conſtantly. Some it affects in one leg, and ſome in both. It cauſes no pain, but itching; nor does the ſwelled leg ſeem heavier to the owner than the ſmall one, though ſome have been ſeen a yard in circumference at the ancle. The Romiſh legends impute the cauſe of this diſtemper (for which no preventative or cure hath been hitherto found) to a curſe laid by St Thomas upon his murderers and their poſterity; though, according to the Romans themſelves, St Thomas was killed by the Tillinga prieſts at Meliaphûr, on the coaſt of Coromandel, about 400 miles diſtant, and where the natives have not this diſtemper.

ANDREAS (John), a celebrated canoniſt in the 14th century, was born at Mugello, near Florence; and was profeſſor of canon-law at Padua, Piſa, and afterwards at Bologna. It is ſaid that he macerated his body with faſting; and lay upon the bare ground every night for 20 years together, covered only with the ſkin of a bear. This is atteſted by very good authors; but if the ſtory which Poggius tells of him in his Jeſts be true, he muſt afterwards have relaxed much of this continency: "Joannem Andream, (ſays he), doctorem Bonnonienſem, cujus fama admodum vulgata eſt, ſubagitantem ancillam domeſticam uxor deprehendit: re inſueta ſtupefacta mulier in virum verſa, Ubi nunc, ait, Joannes, eſt ſapientia veſtra? ille nil amplius locutus, In vulva iſtius, reſpondit, loca admodum ſapientiæ accommodato." The French tranſlation of this perhaps will not be diſpleaſing.

Jean, dit André, fameux Docteur des Loix,
Fut pris un jour au péché d'amourette:
Il acolloit une jeune ſoubrette.
Sa femme vint, fit un ſigne de croix.
Ho ho, dit elle, eſt ce vous? non je penſe:
Vous, dont par tout en vante la prudence.
Qu'eſt devenu cet eſprit ſi ſubtil?
Le bon André, pour ſuivant ſon négoce,
Honteux pourtant, ma foi, repondit-il,
Prudence, eſprit, tout giſt dans cette foſſe.

Since it is agreed that John Andreas had a baſtard, this ſtory is at the bottom very probable; and it was perhaps with the mother of Banicontius that his wife found him. Andreas had a beautiful daughter, named *Novella,* whom he loved extremely: and he is ſaid to have inſtructed her ſo well in all parts of learning, that when he was engaged in any affair which hindered him from reading lectures to his ſcholars, he ſent his daughter in his room; and leſt her beauty ſhould prevent the at-

attention of the hearers, ſhe had a little curtain drawn before her. To perpetuate the memory of this daughter, he intitled his commentary upon the Decretals of Gregory IX. the *Novellæ*. He married her to John Calderinus, a learned canoniſt. The firſt work of Andreas was his Gloſs upon the Sixth Book of the Decretals, which he wrote when he was very young. He wrote alſo Gloſſes upon the Clementines; and a Commentary *in regulas Sexti*, which he intitled *Mercuriales*, becauſe he either engaged in it on Wedneſdays (*diebus Mercurii*,) or becauſe he inſerted his Wedneſdays diſputes in it. He enlarged the Speculum of Durant, in the year 1347. This is all which Mr Bayle mentions of his writings, though he wrote many more. Andreas died of the plague at Bologna, in 1348, after he had been a profeſſor 45 years; and was buried in the church of the Dominicans. Many eulogiums have been beſtowed upon him. He has been called *Archidoctor decretorum*: In his epitaph, *Rabbi doctorum; lux, cenſor normaque morum*; "Rabbi of the doctors, the light, cenſor, and rule of manners:" And it is ſaid, that Pope Boniface called him *lumen mundi*, "the light of the world."

ANDREAS (John) was born a Mahometan, at Xativa in the kingdom of Valencia, and ſucceeded his father in the dignity of alfaqui of that city. He was enlightened with the knowledge of the Chriſtian religion by being preſent at a ſermon in the great church of Valencia on the day of Aſſumption of the bleſſed Virgin, in the year 1487. Upon this he deſired to be baptized; and, in memory of the calling of St John and St Andrew, he received the name John Andreas. "Having received holy orders (ſays he), and, from an alfaqui and a ſlave of Lucifer, become a prieſt and miniſter of Chriſt; I began, like St Paul, to preach and publiſh the contrary of what I had erroneouſly believed and aſſerted; and, with the aſſiſtance of Almighty God, I converted at firſt a great many ſouls of the Moors, who were in danger of hell, and under the dominion of Lucifer, and conducted them into the way of ſalvation. After this, I was ſent for by the moſt catholic princes king Ferdinand and queen Iſabella, in order to preach in Granada to the Moors of that kingdom, which their majeſties had conquered: by God's bleſſing on my preaching, an infinite number of Moors were brought to abjure Mahomet, and to turn to Chriſt. A little after this, I was made a canon by their grace; and ſent for again by the moſt Chriſtian queen Iſabella to Arragon, that I might be employed in the converſion of the Moors of thoſe kingdoms, who ſtill perſiſted in their errors, to the great contempt and diſhonour of our crucified Saviour, and the prodigious loſs and danger of all Chriſtian princes. But this excellent and pious deſign of her Majeſty was rendered ineffectual by her death." At the deſire of Martin Garcia, biſhop of Barcelona, he undertook to tranſlate from the Arabic, into the language of Arragon, the whole law of the Moors; and after having finiſhed this undertaking, he compoſed his famous work of *The Confuſion of the Sect of Mahumed*: it contains twelve chapters, wherein he has collected the fabulous ſtories, impoſtures, forgeries, brutalities, follies, obſcenities, abſurdities, impoſſibilities, lies, and contradictions, which Mahomet, in order to deceive the ſimple people, has diſperſed in the writings of that ſect, and eſpecially in the alcoran, which, as he ſays, was revealed to him in one night by an angel, in the city of Meke; though in another place he contradicts himſelf, and affirms that he was 20 years in compoſing it. Andreas tells us, he wrote this work, that not only the learned among Chriſtians, but even the common people, might know the different belief and doctrine of the Moors; and on the one hand might laugh and ridicule ſuch inſolent and brutal notions, and on the other might lament their blindneſs and dangerous condition. This book, which was publiſhed at firſt in Spaniſh, has been tranſlated into ſeveral languages; all thoſe who write againſt the Mahometans quote it very much.

ANDREINI (Iſabella), a native of Padua, was an excellent poeteſs, and one of the beſt comedians in Italy, towards the beginning of the 17th century. The Intenti of Pavia thought they did their ſociety an honour by admitting her a member of it; and ſhe, in acknowledgement of this honour, never forgot to mention amongſt her titles that of *Academica Infanta*: her titles were theſe, "Iſabella Andreini, comica geloſa, academica infanta, detta l'acceſſa." She was alſo a woman of extraordinary beauty; which, added to a fine voice, made her charm both the eyes and ears of the audience. She died of a miſcarriage, at Lyons, the 10th of June, 1604, in the 42d year of her age. Her death being a matter of general concern and lamentation, there were many Latin and Italian elegies printed to her memory: ſeveral of theſe pieces were placed before her poems in the edition of Milan, in 1605. Beſides her ſonnets, madrigals, ſongs, and eclogues, there is a paſtoral of hers intitled Myrtilla, and letters, printed at Venice in 1610. She ſung extremely well, played admirably on ſeveral inſtruments, underſtood the French and Spaniſh languages, and was not unacquainted with philoſophy.

ANDRELINUS (Publius Fauſtus), born at Forli in Italy. He was a long time profeſſor of poetry and philoſophy in the univerſity of Paris. Lewis XII. of France made him his poet laureat; and Eraſmus tells us he was likewiſe poet to the queen. His pen was not wholly employed in making verſes; for he wrote alſo moral and proverbial letters in proſe, which were printed ſeveral times. His poems, which are chiefly in Latin, are inſerted in Vol. I. of the *Deliciæ Poetarum Italorum*. Mr De la Monnoie tells us, "that Andrelinus, when he was but 22 years old, received the crown of laurel: That his love-verſes, divided into four books, intitled *Livia*, from the name of his miſtreſs, were eſteemed ſo fine by the Roman Academy, that they adjudged the prize of the Latin elegy to the author." He died in 1518. This author's manner of life was not very exemplary; yet he was ſo fortunate, ſays Eraſmus, that though he took the liberty of rallying the divines, he was never brought into trouble about it.

ANDREW (St), the apoſtle, born at Bethſaida in Galilee, brother to Simon Peter. He had been a diſciple of John the baptiſt, and followed Jeſus upon the teſtimony given of him by the baptiſt, (John i. 30, 37, &c.) He followed our Saviour with another of John's diſciples, and went into the houſe where Jeſus lodged; here he continued from about four o'clock in the afternoon till it was night. This was the firſt diſciple whom our Saviour received into his train. Andrew introduced his brother Simon, and they paſſed a day with Chriſt, after which they went to the marriage in Cana (*id.* ii.), and at laſt returned to their ordinary occupation. Some months after, Jeſus meeting them while they were both fiſhing together, called them to him, and promiſed to make them fiſhers of men. Immediately they left their nets, followed him, (Matt. iv. 19.) and never afterwards ſeparated from him.

After our Saviour's aſcenſion, his apoſtles having determined by lot what parts of the world they ſhould ſeverally take, Scythia and the neighbouring countries fell to St Andrew, who according to Euſebius, after he had planted the goſpel in ſeveral places, came to Patræ in Achaia, where, endeavouring to convert the proconſul Ægeas, he was by that governor's orders ſcourged, and then crucified. The particular time of his ſuffering martyrdom is not known; but all the ancient and modern martyrologies, both of the Greeks and Latins, agree in celebrating his feſtival upon the 30th of November. His body was embalmed, and decently interred at Patræ by Maximilla, a lady of great quality and eſtate. Afterwards it was removed to Conſtantinople by Conſtantine the Great, and buried in the great church, which he had built to the honour of the apoſtles. There is a croſs to be ſeen at this day in the church of St Victor at Marſeilles, which is believed by the Romaniſts to be the ſame that St Andrew was faſtened to. It is in the ſhape of the letter X, and is incloſed in a ſilver ſhrine. Peter Chryſologus ſays, that he was crucified upon a tree; and the ſpurious Hippolytus aſſures us it was an olive-tree.

ANDREW, or *Knights of St* ANDREW, an order of knights, more uſually called the order of the thiſtle. (See THISTLE.)

Knights of St ANDREW, is alſo an order inſtituted by Peter the Great of Muſcovy in 1698; the badge of which is a golden medal; on one ſide whereof is repreſented St Andrew's croſs, with theſe words, *Cazar Pierre monarque de tout la Ruſſie.* This medal, being faſtened to a blue ribbon, is ſuſpended from the right ſhoulder.

St ANDREW'*s Croſs*, one in form of the letter X. (See CROSS.)

St ANDREW'*s Day*, a feſtival of the Chriſtian church, celebrated on the 30th of November, in honour of the apoſtle St Andrew.

ANDREW's (St), a town of Fifeſhire, in Scotland, once the metropolis of the Pictiſh kingdom, lying in W. Long. 2. 25. N. Lat. 56. 18. If we may credit legend, St Andrew's owes its origin to a ſingular accident. St Regulus (or St *Rule*, as he is likewiſe called), a Greek of Achaia, was warned by a viſion to leave his native country, and viſit Albion, an iſle placed in the remoteſt part of the world; and to take with him the arm-bone, three fingers, and three toes, of St Andrew. He obeyed, and ſet ſail with his companions, but had a very tempeſtuous paſſage. After being toſſed for ſome time on a ſtormy ſea, he was at laſt ſhipwrecked on the coaſts of Otholania, in the territories of Herguſtus king of the Picts, in the year 370. On hearing of the arrival of the ſtrangers, with their precious relicts, the king immediately gave orders for their reception, afterwards preſenting the ſaint with his own palace, and building near it the church, which ſtill bears the name of *St Regulus.*

At this time the place was ſtiled *Mucroſs*, or the *land of boars:* all round was foreſt, and the lands beſtowed on the Saint were called *Byrehid.* The boars equalled in ſize the ancient Erymanthian; as a proof of which, two tuſks, each ſixteen inches long and four thick, were chained to the altar of St Andrew's. St Regulus changed the name to *Kilrymont;* and eſtabliſhed here the firſt Chriſtian prieſts of the country, called *Culdees.* This church was ſupreme in the kingdom of the Picts; Ungus having granted to God and St Andrew, that it ſhould be the head and mother of all the churches in his dominions. He alſo directed that the croſs of St Andrew ſhould become the badge of the country. In 518, after the conqueſt of the Picts, he removed the epiſcopal ſee to St Andrew's, and the Biſhop was ſtyled *maximus Scotorum epiſcopus.* In 1441, it was erected into an archbiſhopric by Sextus IV. at the interceſſion of James III. In 1606, the priory was ſuppreſſed; and, in 1617, the power of election was transferred to eight biſhops, the principal of St Leonard's college, the archdeacon, the vicars of St Andrew's, Leuchars, and Coupar. This ſee contained the greateſt part of the ſhire of Fife, with a part of Perth, Forfar, and Kincardine ſhires, and a great number of pariſhes, churches, and chapels in other dioceſes.

The town of St Andrew's was erected into a royal borough by David I. in the year 1140, and their privileges afterwards confirmed. The charter of Malcolm II. is preſerved in the tolbooth; and appears written on a bit of parchment, but the contents equally valid with what would at this time require whole ſkins. Here alſo are kept the ſilver keys of the city; which, for form's ſake, are delivered to the king, if he ſhould viſit the place, or to a victorious enemy, in token of ſubmiſſion. In this place, likewiſe, is to be ſeen the monſtrous ax which, in 1646, took off the heads of Sir Robert Spotſwood and other diſtinguiſhed loyaliſts. The town underwent a ſiege in 1337; at which time it was poſſeſſed by the Engliſh, and other partizans of Baliol; but the loyaliſts, under the Earls of March and Fife, made themſelves maſters of it in three weeks, by the help of their battering machines.

St Andrew's is now greatly reduced in the number of its inhabitants; at preſent ſcarcely exceeding 2000. It is impoſſible to aſcertain the ſum when it was the ſeat of the primate: all that can be known is, that during the period of its ſplendor, there were between 60 and 70 bakers; but now 9 or 10 are ſufficient for the place. It is a mile in circuit, and contains three principal ſtreets. On entering the weſt port, a well-built ſtreet, ſtraight, and of a vaſt length and breadth, appears; but ſo graſs-grown, and preſenting ſuch a dreary ſolitude, that it forms the perfect idea of having been laid waſte by the peſtilence.

The cathedral of St Andrew's was founded by Biſhop Arnold in 1161, but did not attain its full magnificence till 1318. Its length from eaſt to weſt was 370 feet; that of the tranſept, 322. But tho' this vaſt pile was 157 years in building, John Knox, in June 1559, effected its demolition in a ſingle day; and ſo effectually has it been deſtroyed, that nothing now remains but part of the eaſt and weſt ends, and of the ſouth ſide.

Near the eaſt end is the chapel of St Regulus; the tower of which is a lofty equilateral triangle, of 20 feet each ſide, and 103 feet high; the body of the chapel remains, but the two ſide-chapels are ruined. The arches of the windows and doors are round, and ſome even more than ſemicircles: an undoubted proof of their antiquity.

The priory was founded by Alexander I. in 1122; and the monks (canons regular of St. Auguſtine) were brought from Scone, in 1140, by Robert, biſhop of this ſee. By an act of parliament, in the time of James I. the prior had precedence of all abbots and priors, and on the days of feſtival wore a mitre and all epiſcopal ornaments. Dependent on this priory were thoſe of Lochleven, Portmoak, Monimuſk, the Iſle of May, and Pittenweem, each originally a ſeat of the Culdees. The revenues of the houſe were vaſt, viz. In money 2237l. 2s. 10d$\frac{1}{2}$.; 38 chaldrons, 1 boll, 3 firlots of wheat; 132 ch. 7 bolls of bear; 114 ch. 3 bolls 1 peck of meal; 151 ch. 10 bolls 1 firlot 1 peck and a half of oats; 3 ch. 7 bolls of peas and beans: 480 acres of land alſo belonged to it. Nothing remains of the priory except the walls of the precinct, which ſhow its vaſt extent. In one part is a moſt artleſs gateway, formed only of ſeven ſtones. This incloſure begins near the cathedral, and extends to the ſhore.

The other religious houſes were, one of Dominicans, founded in 1274, by biſhop Wiſhart; another of Obſervantines, founded by biſhop Kennedy, and finiſhed by his ſucceſſor Patrick Graham in 1478; and, according to ſome, the Carmelites had a fourth.

Immediately above the harbour ſtood the collegiate church of Kirk-heugh, originally founded by Conſtantine III. who, retiring from the world, became here a Culdee. From its having been firſt built on a rock, it was ſtyled, *Præpoſitura Sanctæ* MARIÆ *de rupe*.

On the eaſt ſide of the city are the poor remains of the caſtle, on a rock overlooking the ſea. This fortreſs was founded, in 1401, by Biſhop Trail, who was buried near the high altar of the cathedral, with this ſingular epitaph:

> *Hic fuit eccleſiæ directa columna, feneſtra*
> *Lucida thuribulum redolens, campana ſonora.*

This caſtle was the reſidence of cardinal Beaton; who, after the death of George Wiſhart, apprehending ſome danger, cauſed it to be fortified ſo ſtrongly as to be at that time deemed impregnable. In this fortreſs, however, he was ſurprized and aſſaſſinated by Norman Leſly with 15 others. They ſeized on the gate of the caſtle early in the morning of May 29, 1546; it having been left open for the workmen who were finiſhing the fortifications; and having placed centinels at the door of the cardinal's apartment, they awakened his numerous domeſtics one by one; and, turning them out of the caſtle, they, without violence, tumult, or offering any injury to any other perſon, inflicted on Beaton the death he juſtly merited. The conſpirators were immediately beſieged in this caſtle by the regent, earl of Arran; and notwithſtanding they had acquired no greater ſtrength than 150 men, they reſiſted all his efforts for five months. This, however, was owing to the unſkilfulneſs of the beſiegers more than to the ſtrength of the place or the valour of the beſieged; for in 1547 the caſtle was reduced and demoliſhed. The entrance of it is ſtill to be ſeen; and the window is ſhown, out of which it is ſaid the cardinal leaned to glut his eyes with the cruel martyrdom of George Wiſhart, who was burnt on a ſpot beneath.

In the church of St Salvator is a moſt beautiful tomb of biſhop Kennedy, who died, an honour to his family, in 1466. The Gothic work is uncommonly elegant. Within the tomb were diſcovered ſix magnificent maces, which had been concealed here in troubleſome times. One was given to each of the other three Scotch univerſities, and three are preſerved here. In the top is repreſented our Saviour; around are angels, with the inſtruments of the paſſion.

With theſe are ſhown ſome ſilver arrows, with large ſilver plates affixed to them, on which are inſcribed the arms and names of the noble youth, victors in the annual competitions in the generous art of archery, which were dropt but a few years ago; and golf is now the reigning game. That ſport, and foot-ball, were formerly prohibited, as uſeleſs and unprofitable to the public; and at all *weapon ſchawings*, or reviews of the people, it was ordered, that *fute-ball and golfe be utterly cryed down, and that bow-markes be maid at ilk pariſh kirk, a pair of butts and ſchutting be uſed: and that ilk man ſchutte ſax ſhottes at leaſt, under the paine to be raiſed upon them that cummis not, at leaſt twa pennyes, to be given to them that cummis to be bow-markes to drinke.*

The celebrated univerſity of this city was founded in 1411, by biſhop Wardlaw; and the next year he obtained from Benedict III. the bull of confirmation. It conſiſted once of three colleges. 1. St Salvator's, founded in 1458, by biſhop Kennedy. This is a handſome building, with a court or quadrangle within: on one ſide is the church, on another the library; the third contains apartments for ſtudents: the fourth is unfiniſhed. 2. St Leonard's college was founded by prior Hepburn, in 1522. This is now united with the laſt, and the buildings ſold and converted into private houſes. 3. The new, or St Mary's college, was eſtabliſhed by archbiſhop Hamilton in 1553; but the houſe was built by James and David Bethune, or Beaton, who did not live to complete it. This is ſaid to have been the ſite of a *ſchola illuſtris* long before the eſtabliſhment even of the univerſity; where ſeveral eminent clergymen taught, gratis, the ſciences and languages. But it was called the *new college*, becauſe of its late erection into a divinity college by the archbiſhop.

The univerſity is governed by a chancellor, an office originally deſigned to be perpetually veſted in the archbiſhop of St Andrew's; but ſince the reformation, he is elected by the two principals, and the profeſſors of both the colleges.

The rector is the next great officer; to whoſe care is committed the privileges, diſcipline, and ſtatutes of the univerſity. The colleges have their rectors, and profeſſors of different ſciences, who are indefatigable in their attention to the inſtruction of the ſtudents, and to that eſſential article, their morals. This place poſſeſſes ſeveral very great advantages reſpecting the education of youth. The air is pure and ſalubrious; the place for exerciſe, dry and extenſive; the exerciſes themſelves are healthy and innocent. The univerſity is fixed in a peninſulated country; remote from all commerce with the world, the haunt of diſſipation. From the ſmallneſs of the ſociety every ſtudent's character is perfectly known.

No little irregularity can be committed, but it is inſtantly diſcovered and checked: vice cannot attain a head in this place, for the incorrigible are never permitted to remain the corrupters of the reſt.

The trade of St Andrew's was once very conſiderable. So late as the reign of Charles I. this place had 30 or 40 trading veſſels, and carried on a conſiderable herring and white fiſhery, by means of buſſes, in deep water; which fiſheries had for ages been the grand ſource of their commerce, wealth, and ſplendour. After the death of the king, this whole coaſt, and St Andrew's in particular, became a ſcene of murder, plunder, and rapine: every town ſuffered in proportion to its magnitude and opulence. Nor were thoſe hypocritical ruffians ſatisfied with the ſhipping, merchandiſe, plate, cattle, and whatever came within their ſight; they alſo laid the whole coaſt under contribution. St Andrew's was required to pay 1000l. but the inhabitants not being able to raiſe that ſum after being thus plundered, the general compounded for 500l. which was raiſed by a loan at intereſt, and hath remained a burden upon the corporation, it is believed, ever ſince.

The harbour is artificial, guarded by piers, with a narrow entrance, to give ſhelter to veſſels from the violence of a very heavy ſea, from the encroachments of which it has ſuffered much. The manufactures this city might in former times poſſeſs, are now reduced to one, that of golf-balls; which, trifling as it may ſeem, maintains a great number of people. It is, however, commonly fatal to the artiſts; for the balls are made by ſtuffing a great quantity of feathers into a leathern caſe, by help of an iron rod, with a wooden handle, preſſed againſt the breaſt, which ſeldom fails to bring on a conſumption.

ANDREWS (Lancelot), biſhop of Wincheſter, was born at London in 1555, and educated at Cambridge. After ſeveral preferments, he was made biſhop, firſt of Chicheſter, then of Ely, and, in 1618, was raiſed to the ſee of Wincheſter. This very learned prelate, who was diſtinguiſhed by his piety, charity and integrity, may be juſtly ranked with the beſt preachers and completeſt ſcholars of his age; he appeared to much greater advantage in the pulpit than he does now in his works, which abound with Latin quotations and trivial witticiſms. His ſermons, though full of puns, were ſuited to the taſte of the times in which he lived, and were conſequently greatly admired. He was a man of polite manners and lively converſation; and could quote Greek and Latin authors, or even pun with king James. There is a pleaſant ſtory related of him in the life of Waller the poet. When that gentleman was young, he had the curioſity to go to court, and ſtood in the circle to ſee king James dine; where, among other company, there ſat at table two biſhops, Neale and Andrews. The king propoſed aloud this queſtion, Whether he might not take his ſubjects money when he needed it, without all this formality of parliament? Neale replied, "God forbid you ſhould not, for you are the breath of our noſtrils." Whereupon the king turned, and ſaid to the biſhop of Wincheſter, "Well, my lord, what ſay you?" "Sir, (replied the biſhop), I have no ſkill to judge of parliamentary caſes." The king anſwered, "No put-offs, my lord; anſwer me preſently." "Then, Sir (ſaid he), I think it lawful for you to take my brother Neale's money, for he offers it." Mr Waller ſays, the company was pleaſed with this anſwer, but the wit of it ſeemed to affect the king; for a certain lord coming ſoon after, his majeſty cried out, "O, my lord, they ſay you lig with my lady." "No, Sir (ſays his Lordſhip, in confuſion), but I like her company becauſe ſhe has ſo much wit." "Why then (ſays the king) do not you lig with my lord of Wincheſter there?"—This great prelate was in no leſs reputation and eſteem with king Charles I. than he had been with his predeceſſors. He died at Wincheſter-houſe in Southwark, September 27, 1626, in the 71ſt year of his age; and was buried in the pariſh-church of St Saviour's, where his executors erected to him a very fair monument of marble and alabaſter, on which is an elegant inſcription, in Latin, written by one of his chaplains. Mr Milton alſo, at 17 years of age, wrote a beautiful elegy on his death, in the ſame language. Biſhop Andrews had, 1. A ſhare in the tranſlation of the Pentateuch, and the hiſtorical books from Joſhua to the firſt book of Chronicles excluſively. He alſo wrote, 2. *Tortura Torti*, in anſwer to a work of cardinal Bellarmine, in which that cardinal aſſumes the name of Matthew Tortus. 3. A Manual of Private Devotions: and, 4. A Manual of Directions for the Viſitation of the Sick; beſides the Sermons and Tracts, in Engliſh and Latin, publiſhed after his death.

ANDRIA, in Grecian antiquity, public entertainments firſt inſtituted by Minos of Crete, and, after his example, appointed by Lycurgus at Sparta, at which a whole city or a tribe aſſiſted. They were managed with the utmoſt frugality, and perſons of all ages were admitted, the younger ſort being obliged by the lawgiver to repair thither as to ſchools of temperance and ſobriety.

ANDRIA, is a city and a biſhop's ſee in the territory of Bari, in the kingdom of Naples. It is pretty large, well peopled, and ſeated in a ſpacious plain, four miles from the Adriatic coaſt. E. Long. 17. 4. N. Lat. 41. 15.

ANDRISCUS, a man of mean extraction, who, pretending to be the ſon of Perſeus laſt king of Macedonia, took upon him the name of *Philip*, for which reaſon he was called *Pſeudo-Philippus*, the *Falſe Philip*. After a complete victory over Juventus, the Roman Prætor ſent againſt him, he aſſumed kingly power, but exerciſed it with vaſt cruelty. At laſt, the Romans obliged him to fly into Thrace, where he was betrayed and delivered into the hands of Metellus. This victory gained Macedonia once more into the power of the Romans, and to Metellus the name of *Macedonicus*, but coſt the Romans 25,000 men. Andriſcus adorned the triumph of Metellus, walking in chains before the general's chariot.

ANDROAS, or ANDRODAMAS, among ancient naturaliſts, a kind of pyritæ, to which they attributed certain magical virtues.

ANDROGEUS, in fabulous hiſtory, the ſon of Minos king of Crete, was murdered by the Athenian youth and thoſe of Megara, who envied his being always victor at the Attic games. Minos having afterwards taken Athens and Megara, obliged the inhabitants to ſend him an annual tribute of ſeven young men and as many virgins, to be devoured by the Minotaur; but Theſeus delivered them from that tribute.

ANDROGYNES, in natural hiſtory, a name given

Andro-
gynes.

ven to thoſe living creatures which, by a monſtrous formation of their generative parts, ſeem (for it is only ſeeming) to unite in themſelves the two ſexes, that of the male and of the female. This *luſus naturæ*, this defect, or perhaps redundancy, in the animal-ſtructure, is deſcribed by medical authors in the following manner. ‘ There is a depravation in the ſtructure of the parts intended by nature for propagation, when, beſides thoſe concealed parts that are found neceſſary for the diſcharge of prolific functions, the *pudenda* of the other ſex likewiſe appear. This monſtrous production of nature is diverſified in four different ways; of which three appear in males and one in females. In men, the female pudendum cloathed with hair, ſometimes appears contiguous to the perinæum; at other times in the middle of the ſcrotum; at other times, which conſtitutes the third diverſity, through that part itſelf which in the midſt of the ſcrotum exhibits the form of a pudendum, urine is emitted. Near that part which is the teſt of puberty, and above the pudendum, even in females, the maſculine genitals appear in ſome, conſpicuous in all their three forms, one reſembling the *viretram* or yard, the other like the two teſticles: but for the moſt part it happens, that, of the two inſtruments of generation, one is feeble and inert; and it is extremely rare that both are found ſufficiently valid and proper for feats of love; nay, even in a great many, both theſe members are deficient and impotent, ſo that they can perform the office neither of a male nor of a female.’

With reſpect to them, it appears, from a collation of all the circumſtances which have been obſerved by naturaliſts worthy of credit, that there is no ſuch thing as a perfect *androgyne*, or real hermaphrodite; that is to ſay, a living creature which, by its unnatural, or rather preternatural ſtructure, poſſeſſes the genuine powers of both ſexes, in ſuch a manner as to be qualified for performing the functions of either with ſucceſs: the irregularity of their fabrication almoſt always conſiſts in ſomething ſuperfluous added to one of the two ſexes, which gives it the appearance of the other, without beſtowing the real and characteriſtical diſtinction; and every *hermaphrodite* is almoſt always a very woman. Since this monſtrous exhibition of nature is not ſuch as to abrogate the rights or deſtroy the character of humanity amongſt human beings, this involuntary misfortune implies no right to deprive thoſe upon whom it is inflicted by nature, of the privileges natural to every citizen; and as this deficiency is no more infectious than any other corporeal mutilation, it is not eaſy to ſee why marriage ſhould be prohibited to one of theſe unhappy beings, merely on account of its equivocal appearance, which acts in the character of its prevailing ſex. If ſuch a creature, by the defect of its conſtruction, ſhould be barren; this does not infer any right of diſſolving the marriage which it may have contracted, more than the ſame ſterility proceeding from any cauſe whether known or unknown, if his or her conſort ſhould not on that account require a divorce. It is only the licentious abuſe either of one or the other ſex which can be ſubjected to the animadverſion of the police. See HERMAPHRODITE.

Such are the ſentiments of the authors of the French Encyclopédie. After all, we cannot forbear to add, that from ſuch heterogeneous matches nature ſeems to recoil with innate and inextinguiſhable horror. Nor are any of theſe invincible averſions implanted in our frame without a final cauſe worthy of its Author. We would gladly aſk theſe free-thinking gentlemen, In caſes where the ſexes are ſo unnaturally confounded, how the police can, by its moſt ſevere and rigorous animadverſions, either detect or prevent thoſe licentious abuſes againſt which they remonſtrate? Since, therefore, an evil ſo baneful to human ſociety could no otherwiſe be prevented than by the ſanction of Nature againſt ſuch horrible conjunctions, the inſtinctive antipathy which they inſpire was highly worthy of her wiſdom and purity.

Andro-
gynes,
Androgy-
nous.

ANDROGYNES, in ancient mythology, creatures of whom, according to the fable, each individual poſſeſſed the powers and characters of both ſexes, having two heads, four arms and two feet. The word itſelf is compounded of two Greek radical words; ανδηρ, in genitive ανδρος, a *male*; and γυνη a *female*. Many of the rabbinical writers pretend, that Adam was created double, one body being male, the other female, which in their origin not being eſſentially joined, God afterwards did nothing but ſeparate them.

The gods, ſays Plato in his *Banquet*, had formed the ſtructure of man round, with two bodies and two ſexes. This fantaſtic being, poſſeſſing in itſelf the whole human ſyſtem, was endowed with a gigantic force, which rendered it inſolent, inſomuch that it reſolved to make war againſt the gods. Jupiter, exaſperated, was going to deſtroy it; but, ſorry at the ſame time to annihilate the human race, he ſatisfied himſelf with debilitating this double being, by disjoining the male from the female, and leaving each half to ſubſiſt with its own powers alone. He aſſigned to Apollo the taſk of repoliſhing theſe two half bodies, and of extending their ſkins ſo that their whole ſurface might be covered. Apollo obeyed, and faſtened it at the *umbilicus*: If this half ſhould ſtill rebel, it was once more to be ſubdivided by another ſection, which would only leave it one of the parts of which it was then conſtituted; and even this fourth of a man was to be annihilated, if it ſhould perſiſt in its obſtinacy and miſchief. The idea of theſe *androgynes* might well be borrowed from a paſſage in Moſes, where that hiſtorian of the birth and infancy of nature deſcribes Adam as calling Eve *bone of his bone* and *fleſh of his fleſh*. However this may be, the fable of Plato has been uſed with great ingenuity by a French poet, who has been rendered almoſt as conſpicuous by his misfortunes as by his verſes. With the ancient philoſopher, he attributes the propenſity which attracts one of the ſexes towards the other, to the natural ardour which each half of the *androgynes* feels for reunion; and their inconſtancy, to the difficulty which each of the ſeparated parts encounters in its efforts to recover its proper and original half. If a woman appears to us amiable, we inſtantly imagine her to be that moiety with whom we ſhould only have conſtituted one whole, had it not been for the inſolence of our original double-ſexed progenitor:

> The heart, with fond credulity impreſs'd,
> Tells us the half is found, then hopes for reſt;
> But 'tis our curſe, that ſad experience ſhows,
> We neither find our half nor gain repoſe.

ANDROGYNOUS, in zoology, an appellation given to animals which have both the male and female ſex in the ſame individual.—In botany, the term is applied to ſuch plants as bear both male and female flowers on the ſame root.

ANDROIDES, in mechanics, a human figure, which, by certain ſprings or other movements, is capable of performing ſome of the natural motions of a living man. The motions of the human body are more complicated, and conſequently more difficult to be imitated, than thoſe of any other creature; whence the conſtruction of an *androides*, in ſuch a manner as to imitate any of theſe actions with tolerable exactneſs, is juſtly ſuppoſed to indicate a greater ſkill in mechanics than any other piece of workmanſhip whatever.

A very remarkable figure of this kind appeared in Paris, in the year 1738. It repreſented a flute player, and was capable of performing many different pieces of muſic on the German flute; which, conſidering the difficulty of blowing that inſtrument, the different contractions of the lips neceſſary to produce the diſtinctions between the high and low notes, and the complicated motions of the fingers, muſt appear truly wonderful.

This machine was the invention of M. Vaucanſon, member of the Royal Academy of Sciences; and a particular deſcription of it was publiſhed in the Memoirs of the Academy for that year.

The figure itſelf was about five feet and an half in height, ſituated at the end of an artificial rock, and placed upon a ſquare pedeſtal four feet and an half high and three and an half broad. The air entered the body by three pipes ſeparated one from the other. It was conveyed to them by nine pair of bellows, three of which were placed above and ſix below. Theſe were made to expand and contract regularly in ſucceſſion, by means of an axis of ſteel turned round by ſome clock-work. On this axis were different protuberances at proper diſtances, to which were fixed cords thrown over pullies, and terminating in the upper boards of the bellows, ſo that, as the axis turned, theſe boards were alternately raiſed and let down. A contrivance was alſo uſed to prevent the diſagreeable hiſſing fluttering noiſe uſually attending the motion of bellows. This was by making the cord, by which the bellows was moved, preſs in its deſcent, upon one end of a ſmall lever, the other end of which aſcending forced open the ſmall leathern valve that admitted the air, and kept it ſo, till, the cord being relaxed by the deſcent of the upper board, the lever fell, and the air was forced out. Thus the bellows performing their functions conſtantly without the leaſt hiſſing or other noiſe by which it could be judged in what manner the air was conveyed to the machine. The upper boards of three of the pairs of bellows were preſſed down by a weight of four pounds, thoſe of three others by a weight of two pounds, and thoſe of the three remaining ones by nothing but their own weight.

The three tubes, by which the air entered, terminated in three ſmall reſervoirs in the trunk of the figure. There they united, and, aſcending towards the throat, formed the cavity of the mouth, which terminated in two ſmall lips adapted in ſome meaſure to perform their proper functions. Within this cavity alſo was a ſmall moveable tongue; which by its play, at proper periods, admitted the air, or intercepted its paſſage to the flute.

The fingers, lips, and tongue, received their proper directions by means of a ſteel cylinder turned by clock-work. It was divided into 15 equal parts, which by means of pegs, preſſing upon the ends of 15 different levers, cauſed the other extremities to aſcend. Seven of theſe levers directed the fingers, having wires and chains affixed to their aſcending extremities, which being attached to the fingers, cauſed them to aſcend in proportion as the other extremity was preſſed down by the motion of the cylinder, and *vice verſa*. Thus the aſcent or deſcent of one end of a lever produced a ſimilar aſcent or deſcent in the correſponding finger, by which one of the holes of the flute was occaſionally opened or ſtopped, as by a living performer. Three of the levers ſerved to regulate the ingreſs of the air, being contrived ſo as to open and ſhut, by means of valves, the three reſervoirs of air above mentioned, ſo that more or leſs ſtrength might be given, and a higher or lower note produced as occaſion required. The lips were by a ſimilar mechaniſm, directed by four levers, one of which opened them, to give the air a freer paſſage; the other contracted them; the third drew them backward; and the fourth puſhed them forward. The lips were projected upon that part of the flute which receives the air; and, by the different motions already mentioned, modified the tone in a proper manner.—The remaining lever was employed in the direction of the tongue, which it eaſily moved, ſo as to ſhut or open the mouth of the flute.

Thus we ſee how all the motions neceſſary for a German-flute-player could be performed by this machine; but a conſiderable difficulty ſtill remains, namely, how to regulate theſe motions properly, and make each of them follow in juſt ſucceſſion. This, however, was effected by the following ſimple method. The extremity of the axis of the cylinder was terminated on the right ſide by an endleſs ſcrew, conſiſting of twelve threads, each placed at the diſtance of a line and an half from the other. Above this ſcrew was fixed a piece of copper, and in it a ſteel pivot, which, falling in between the threads of the ſcrew, obliged the cylinder to follow the threads, and, inſtead of turning directly round, it was continually puſhed to one ſide. Hence, if a lever was moved, by a peg placed on the cylinder in any one revolution, it could not be moved by the ſame peg in the ſucceeding revolution, becauſe the peg would be moved a line and a half beyond it by the lateral motion of the cylinder. Thus, by an artificial diſpoſition of theſe pegs in different parts of the cylinder, the ſtatue was made, by the ſucceſſive elevation of the proper levers, to exhibit all the different motions of a flute-player, to the admiration of every one who ſaw it.

The conſtruction of machines capable of imitating even the mechanical actions of the human body, ſhow exquiſite ſkill; but what ſhall we ſay of one capable, not only of imitating actions of this kind, but of acting as external circumſtances require, as though it were endowed with life and reaſon? This, nevertheleſs, has been done. M. de Kempelen, a gentleman of Preſburg in Hungary, excited by the performances of M. de Vaucanſon, at firſt endeavoured to imitate them, and at laſt far excelled them. This gentleman conſtructed an Androides capable of playing at cheſs!—Every one who is in the leaſt acquainted with this game muſt know, that it is ſo far from being mechanically performed, as to require a greater exertion of the judgment and rational faculties than is ſufficient to accompliſh many matters of greater importance. An attempt therefore, to make a wooden cheſs-player, muſt appear as ridiculous as to make a wooden preacher or counſellor of ſtate. That this machine really was made, however, the public have had ocular demonſtration. The inventor went to Britain in 1783, where he remained above a year with his automaton.

It is a figure as large as life, in a Turkiſh dreſs, ſitting behind a table with doors, of three feet and a half in length, two in depth, and two and a half in height. The chair on which it ſits is fixed to the table, which runs on four wheels. The automaton leans its right arm on the table, and in its left hand holds a pipe: with this hand it plays after the pipe is removed. A cheſs-board of 18 inches is fixed before it. This table, or rather cupboard, contains wheels, levers, cylinders, and other pieces of mechaniſm; all which are publicly diſplayed. The veſtments of the automaton are then lifted over its head, and the body is ſeen full of ſimilar wheels and levers. There is a little door in its thigh, which is likewiſe opened; and with this, and the table alſo open, and the automaton uncovered, the whole is wheeled about the room. The doors are then ſhut, and the automaton is ready to play; and it always takes the firſt move.

At every motion the wheels are heard; the image moves its head, and looks over every part of the cheſs-board. When it checks the queen, it ſhakes its head twice, and thrice in giving check to the king. It likewiſe ſhakes its head when a falſe move is made, replaces the piece, and makes its own move; by which means the adverſary loſes one.

M. de Kempelen remarks, as the moſt ſurpriſing circumſtance attending his automaton, that it had been exhibited at Preſburg, Vienna, Paris, and London, to thouſands, many of whom were mathematicians and cheſs-players, and yet the ſecret by which he governed the motion of its arm was never diſcovered. He prided himſelf ſolely on the conſtruction of the mechanical powers, by which the arm could perform ten or twelve moves. It then required to be wound up like a watch, after which it was capable of continuing the ſame number of motions.

The automaton could not play unleſs M. de Kempelen or his ſubſtitute was near it to direct its moves. A ſmall ſquare box, during the game, was frequently conſulted by the exhibiter; and herein conſiſted the ſecret, which he ſaid he could in a moment communicate. He who could beat M. de Kempelen was, of courſe, certain of conquering the automaton. It was made in 1769. His own account of it was; "C'eſt une bagatelle qui n'eſt pas ſans merite du cote du mechaniſme, mais les effets n'en paroiſſent ſi merveilleux que par la hardieſſe de Pidee, & par l'heureux choiz dez moyens employes pour faire illuſion."

The ſtrongeſt and beſt-armed loadſtone was allowed to be placed on the machine by any of the ſpectators.

As the inventor of this admirable piece of mechaniſm hath not yet thought proper to communicate to the public the means by which it is actuated, it is in vain for any, except thoſe who are exquiſitely ſkilled in mechanics, to form conjectures concerning them.—Many other curious imitations of the human body, as well as that of other animals, have been exhibited, though none of them equal to the laſt mentioned one. See the article Automaton.

ANDROLEPSY, in Grecian antiquity, an action allowed by the Athenians againſt ſuch as protected perſons guilty of murder. The relations of the deceaſed were empowered to ſeize three men in the city or houſe whither the malefactor had fled, till he were either ſurrendered, or ſatisfaction made ſome way or other for the murder.

ANDROMACHE, the wife of the valiant Hector, the mother of Aſtyanax, and daughter of Eton king of Thebes in Cilicia. After the death of Hector and the deſtruction of Troy, ſhe married Pyrrhus; and afterwards Helenus the ſon of Priam, with whom ſhe reigned over part of Epirus.

ANDROMEDA, in aſtronomy, a northern conſtellation, behind Pegaſus, Caſſiopeia, and Perſeus. It repreſents the figure of a woman chained; and is fabled to have been formed in memory of Andromeda, daughter of Cepheus and Caſſiopeia, and wife of Perſeus, by whom ſhe had been delivered from a ſea-monſter, to which ſhe had been expoſed to be devoured for her mother's pride. Minerva tranſlated her into the heavens.

The ſtars in the conſtellation Andromeda in Ptolemy's catalogue are 23, in Tycho's 22, in Bayer's 27, in Mr Flamſted's no leſs than 84.

Andromeda, the name of a celebrated tragedy of Euripides, admired by the ancients above all the other compoſitions of that poet, but now loſt.

It was the repreſentation of this play, in a hot ſummer day, that occaſioned that epidemic fever, or phrenzy, for which the Abderites are often mentioned, wherein they walked about the ſtreets, rehearſing verſes, and acting parts of this piece. See Abdera.

Andromeda, or *Marſh Cyſtus*: A genus of the monogynia order, belonging to the decandria claſs of plants; and in the natural method ranking under the 18th order, *Bicornes*. The characters are: The *calyx* is a quinquepartite perianthium, ſmall, coloured, and perſiſtent: The *corolla* is monopetalous, campanulated, and quinquefid, with reflected diviſions: The *ſtamina* conſiſt of ten ſubulated filaments, ſhorter than the corolla; the antheræ two-horned and nodding: The *piſtillum* has a roundiſh germen; a cylindric ſtylus larger than the ſtamina, and perſiſtent; and an obtuſe ſtigma: The *pericarpium* is a roundiſh five-cornered capſule, with five cells and five valves: The *ſeeds* are very numerous, roundiſh, and gloſſy.

Species. 1. The polifolia is a low plant, growing naturally in bogs in the northern countries. It is difficultly preſerved in gardens; and, being a plant of no great beauty, is ſeldom cultivated. 2. The mariana, a native of North America. It is a low ſhrub, ſending out many woody ſtalks from the root, which are garniſhed with oval leaves placed alternately; the flowers are collected in ſmall bunches, are of an herbaceous colour, and ſhaped like thoſe of the ſtrawberry-tree. They appear in June and July. 3. The paniculata* is a native of Virginia and Carolina, growing in moiſt places. The plants uſually arrive at the height of ten feet, with thin leaves ſet alternately, and having their edges finely ſerrated. The flowers are tubulous, ſmall, and of a greeniſh white, cloſely ſet horizontally on one ſide of the ſlender ſtalks. Theſe flowers are ſucceeded by berries, which open when ripe; and divide into five ſections,

* Plate XXXI. fig. 2.

tions, incloſing many ſmall ſeeds. 4. The arborea is a native of the ſame countries, where it is called the *ſorrel-tree*. It grows to the height of 20 feet, with a trunk uſually five or ſix inches thick. The branches are ſlender, thick ſet with leaves like thoſe of the pear-tree. From the ends of the branches proceed many ſlender ſtalks, on one ſide of which hang many ſmall white flowers like thoſe of the ſtrawberry-tree. 5. The calyculata, is a native of Siberia, and likewiſe of North-America. It grows on moſſy land, and is therefore very difficult to keep in gardens. The leaves are ſhaped like thoſe of the box-tree, and are of the ſame conſiſtence, having ſeveral ſmall punctures on them. The flowers grow in ſhort ſpikes from the extremity of the branches. They are produced ſingle between two leaves, are of a white colour, and a cylindrical or pitcher-like ſhape. There are ten other ſpecies.

Propagation and Culture. All theſe ſorts, except four, are hardy plants. The fourth ſpecies requires to be ſheltered from froſt in winter, but in the ſummer ſhould be frequently watered.

The above plants ſucceed beſt upon boggy and moiſt grounds. You muſt procure the ſeeds from the places where they grow naturally; a year before which a boggy or the moiſteſt part of your garden ſhould be dug, and the roots of all weeds cleared off. As the weeds begin to riſe, ſo conſtantly ſhould the ground be again dug, and ſea or drift ſand ſhould be plentifully mixed with the natural ſoil. By this management till the ſeeds arrive, the ground being made tolerably fine, the ſeeds ſhould be ſown very ſhallow in the moiſt or boggy land; or if the land ſhould be ſo boggy that it cannot be eaſily worked ſo as to be proper for the reception of the ſeeds, then let a ſufficient quantity of ſoil from a freſh paſture, mixed with drift ſand, be laid over the bog, and let the ſeeds be ſown therein. The bog will in time abſorb this ſoil, but the ſeeds will come up; and this is the moſt effectual method of procuring plants of this kind from ſeeds. The firſt year after they come up they ſhould be ſhaded in very hot weather: and after that they will require little or no care. Another method of increaſing theſe ſhrubs is by layers or ſuckers; ſo that whoever has not the conveniency of procuring the ſeeds from abroad, ſhould get a plant or two of the ſorts he moſt likes. Theſe he ſhould plant in a boggy ſituation, and in a very little time he will have increaſe enough; for they throw out ſuckers in prodigious plenty, and, if they like the ſituation, to a great diſtance. Theſe may be taken off, and planted where they are to remain.

ANDRON, in Grecian antiquity, denotes the apartment in houſes deſigned for the uſe of men; in which ſenſe it ſtands oppoſed to *Gynæceum*.—The Greeks alſo gave their dining-rooms the title of *andron*, becauſe the women had no admittance to feaſts with the men.

ANDRONA, in ancient writers, denotes a ſtreet, or public place, where people met and converſed together. In ſome writers, *androna* is more expreſsly uſed for the ſpace between two houſes; in which ſenſe, the Greeks alſo uſe the term ανδρωνας, for the way or paſſage between two apartments.

Androna is alſo uſed, in eccleſiaſtical writers, for that part in churches deſtined for the men. Anciently it was the cuſtom for the men and women to have ſeparate apartments in places of worſhip, where they performed their devotions aſunder; which method is ſtill religiouſly obſerved in the Greek church. The ανδρων, or *androna*, was in the ſouthern ſide of the church, and the womens apartment on the northern.

ANDRONICUS I. Emperor of the Eaſt, cauſed Alexius II. who had been put under his care, to be ſtrangled; and then took poſſeſſion of the throne of Conſtantinople in 1183: but the people becoming exaſperated at his cruelties, proclaimed Iſaac Angelus emperor, and put Andronicus in irons: they then thruſt out his eyes; and, having led him through the city in an ignominious manner, hanged him.

Andronicus of Cyrrhus, built at Athens an octagon tower, with figures carved on each ſide, repreſenting the eight principal winds. A braſs triton at the ſummit, with a rod in its hand, turned round by the wind, pointed to the quarter from whence it blew. From this model is derived the cuſtom of placing weathercocks on ſteeples.

ANDROPHAGI, in ancient geography, the name of a nation whoſe country, according to Herodotus, was adjacent to Scythia. Their name, compounded of two Greek words, ſignifies *man-eaters*. Herodotus does not inform us whether their manner of ſubſiſting correſponded with their name; whether they were ſo ſavage as to eat human fleſh. See the article Anthropophagi. They are repreſented, however, as the moſt barbarous and fierce of all nations. They were not governed by laws: the care of their cattle was their chief employment. Their dreſs was like that of the Scythians; and they had a language peculiar to themſelves.

ANDROPOGON, or Man's-beard, in botany: A genus of the monœcia order, belonging to the polygamia claſs; and in the natural method ranking under the 4th order, *Gramina*. The *hermaphrodite* calyx is a one-flowered bivalved glume: The *corolla* is a bivalved glume awn'd at the baſe: The *ſtamina* conſiſt of three capillary filaments; the antheræ are oblong and bifurcated: The *piſtillum* has an oval germen; with two capillary ſtyli coaleſced, and villous ſtigmata: There is no *pericarpium*: The *ſeed* is one, ſolitary, and covered. The *male* calyx, corolla, and ſtamina, the ſame with the hermaphrodite; but the corolla without the awn.—There are above 18 ſpecies. Of theſe the moſt remarkable is the nardus, which produces the Indian nard or ſpikenard of the ſhops. The ſpikenard, as brought from the Eaſt Indies, is a congeries of ſmall fibres iſſuing from one head, and matted cloſe together, ſo as to form a bunch about the ſize of the finger, with ſome ſmall ſtrings at the oppoſite end of the head. The matted fibres (which are the parts choſen for medicinal purpoſes) are ſuppoſed by ſome to be the head or ſpike of the plant, by others the root: they ſeem rather to be the remains of the withered ſtalks, or the ribs of the leaves: ſometimes entire leaves and pieces of ſtalks are found among them: we likewiſe now and then meet with a number of theſe bunches iſſuing from one root. Spikenard has a warm, pungent, bitteriſh taſte; and a ſtrong not very agreeable ſmell. It is ſtomachic and carminative; and ſaid to be alexipharmac, diuretic, and emmenagogue; but at preſent it is very little employed.

ANDROS, one of the ancient Cyclades, lying between Tenedos and Eubœa: being one mile diſtant from the former, and ten from the latter. The ancients gave it various names, viz. Cauros, Laſia, Nonagria, Epagris, Antandros, and Hydruſia. The name of *Andros* it received from one Andreus, appointed, according to Diodorus Siculus, by Rhadamanthus, one of the generals, to govern the Cyclades, after they had of their own accord ſubmitted to him. As to the name of *Antandros*, the ſame author tells us, that Aſcanius the ſon of Æneas, being taken priſoner by the Pelaſgians, gave them this iſland for his ranſom, which on that account was called *Antandros*, or "delivered for one man." The name of *Hydruſia* it obtained in common with other places well ſupplied with water. It had formerly a city of great note, bearing the ſame name, and ſituated very advantageouſly on the brow of a hill, which commanded the whole coaſt. In this city, according to Strabo and Pliny, ſtood a famous temple dedicated to Bacchus. Near this temple, Mutianus, as quoted by Pliny, tells us, there was a ſpring called the *gift of Jupiter;* the water of which had the taſte of wine in the month of January, during the feaſt of Bacchus, which laſted ſeven days. The ſame author adds, that the waters, if carried to a place whence the temple could not be ſeen, loſt their miraculous taſte. Pauſanius makes no mention of this ſpring; but ſays, that, during the feaſt of Bacchus, wine flowed, or was at leaſt by the Andrians believed to flow, from the temple of that god. The prieſts, no doubt, found their account in keeping up this belief, by conveying, through ſecret conduits, a great quantity of wine into the temple.

The Andrians were the firſt of all the iſlanders who joined the Perſians at the time Xerxes invaded Greece; and therefore Themiſtocles, after the victory at Salamis, reſolved to attack the city of Andros, and oblige the inhabitants to pay large contributions for the maintenance of his fleet. Having landed his men on the iſland, he ſent heralds to the magiſtrates, acquainting them, that the Athenians were coming againſt them with two powerful divinities, *perſuaſion* and *force;* and therefore they muſt part with their money by fair means or foul. The Andrians replied, that they likewiſe had two mighty deities who were very fond of their iſland, viz. *poverty* and *impoſſibility;* and therefore could give no money. Themiſtocles, not ſatisfied with this anſwer, laid ſiege to the town; which he probably made himſelf maſter of and deſtroyed, as we are informed by Plutarch, that Pericles, a few years after, ſent thither a colony of 250 Athenians. It was, however, ſoon retaken by the Perſians; and, on the overthrow of that empire by Alexander the Great, ſubmitted to him, along with the other iſlands. On his death it ſided with Antigonus, who was driven out by Ptolemy. The ſucceſſors of the laſt mentioned prince held it to the time of the Romans; when Attalus, king of Pergamus, beſieged the metropolis at the head of a Roman army; and, having taken it, was by them put in poſſeſſion of the whole iſland. Upon the death of Attalus, the republic claimed this iſland, as well as his other dominions, in virtue of his laſt will.

Andros is now ſubject to the Turks; and contains a town of the ſame name, with a great many villages. It is the moſt fruitful iſland in all the Archipelago, and yields a great quantity of ſilk. There are ſaid to be about 6000 inhabitants, beſides thoſe of the villages Arni and Amoldeos, who are about two hundred, have a different language and cuſtoms, and are called *Albaneis.* There are ſeven monaſteries, a great number of churches, and a cathedral for the biſhops of the Roman catholic perſuaſion; but moſt of the inhabitants are of the Greek communion. The Jeſuits had a houſe and a church in this iſland; but they were forced to quit them long ago. Here are ſome delightful valleys; but the air is bad, and the water of the city worſe. The women would be agreeable enough, if it was not for their dreſs, which is very unbecoming; for they ſtuff out their cloaths without the leaſt regard to their ſhape; but the Albaneſe women make a much better appearance. The peaſants make wicker-baſkets, wherewith they ſupply the greateſt part of the Archipelago. They have all ſorts of game in the woods and mountains, but know not how to take them for want of guns. Their principal food is goats fleſh; for there is no fiſh to be met with on their coaſts. When they are ſick, they are obliged to let the diſeaſe take its natural courſe, having neither phyſician nor ſurgeon on the iſland. A cadi, aſſiſted by a few of the principal perſons of the iſland, has the management of civil affairs, and his reſidence is in the caſtle: an aga, who preſides over the military force, lives in the tower without the city. About two miles from the preſent town are ſtill to be ſeen the ruins of a ſtrong wall with the fragments of many columns, chapiters, baſes, broken ſtatues, and ſeveral inſcriptions, ſome of which mention the ſenate and people of Andros, and the prieſts of Bacchus; from which it is probable that this was the ſite of the ancient city. E. Long. 25. 30. N. Lat. 37. 50.

ANDROS (anc. geog.), an iſland in the Iriſh ſea, (Pliny), called *Hedros* by Ptolemy: Now *Bardſey*, diſtant about a mile from the coaſt of North-Wales.

ANDROSACE: A genus of the monogynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 21ſt order, *Preciæ.* The eſſential characters are, The *male* calyx is five-leaved; the corolla is five-petal'd; the ſtamina are five, inſerted in the rudiment of the ſtylus: The *female* calyx is five-leav'd; the corolla is wanting; the ſtyli are three; the capſule is trilocular; the ſeeds are two. Of this genus Dr Linnæus reckons ſix

Species. 1. The maxima grows naturally in Auſtria and Bohemia, among the corn. It hath broad leaves, which ſpread near the ground; from the centre of theſe the footſtalks ariſe, which are terminated by an umbel of white flowers like thoſe of the auricula. Theſe appear in April and May, and the ſeeds ripen in June; ſoon after which the plants periſh. 2. The ſeptentrionalis, villoſa, carnea, and lactea, grow naturally on the Alps and Helvetian mountains, as alſo in Siberia. They are much ſmaller than the former, ſeldom growing more than three inches high. Of the other ſpecies called the *elongata*, we have no particular deſcription.

Culture. Theſe plants are propagated by ſeeds, which ſhould be ſown ſoon after they are ripe; otherwiſe they ſeldom come up the ſame year. If permitted to ſcatter, they will grow better than when they are ſown.

ANDRUM, a kind of hydrocele, to which the people of Malabar are very ſubject.—Its origin is derived from the vitious quality of the country waters, impregnated with corroſive muriatic ſalts, the ſource of moſt other diſeaſes that infect the Malabarians. Its ſigns, or ſymptoms, are an eryſipelas of the ſcrotum, returning every new moon, by which the lymphatics, being eroded, pour a ſerous ſaline humour into the cavity of the ſcrotum. The andrum is incurable; thoſe once ſeized with it have it for life: but it is not dangerous, nor very troubleſome, to thoſe uſed to it; tho' ſometimes it degenerates into an hydroſarcocele. The method of prevention is by a heap of ſand fetched from a river of the province Mangatti, and ſtrewed in the wells. This is practiſed by the rich. As to the cure, they have only a palliative one; which is by inciſion, or tapping, and drawing off the water from the ſcrotum, once in a month or two.

ANDRYALA, DOWNY SOW-THISTLE: a genus of the polygamia æqualis order, belonging to the ſyngeneſia claſs of plants; and in the natural method ranking under the 49th order, *Compoſita-ſemifloſculus*. The eſſential characters are: The receptacle is villous; the calyx is many parted, ſubequal, and rounded; and the pappus is ſimple and ſeſſile.

Species. 1. The integrifolia is an annual plant, growing naturally in the ſouth of France, Spain, and Italy. It riſes to the height of a foot and an half, with woolly branching ſtalks. The flowers are produced in ſmall cluſters at the top of the ſtalks. They are yellow, and like thoſe of the ſow-thiſtle; ſo do not make any great appearance. 2. The raguſina is a native of the Cape of Good Hope. The leaves are extremely white, and much indented on their edges. The flower-ſtalks grow about a foot high, having ſmall cluſters of yellow flowers, which appear in July. The ſeeds ſometimes ripen in Britain, but not always. 3. The lanata is a native of Sicily and of the country round Montpelier. The lower leaves are indented and woolly, but thoſe on the ſtalks are entire. It ſeldom riſes more than a foot high, ſupporting a few yellow flowers at top. 4. The ſinuata grows in Spain and Portugal: the leaves are broader, longer, and more downy, than either of the other ſorts; the flower-ſtalks riſing more than a foot high. They branch into ſeveral foot-ſtalks, each ſuſtaining one large yellow flower, ſhaped like thoſe of hawk-weed, which are ſucceeded by oblong black ſeeds covered with down.

Culture. All theſe plants are eaſily propagated by ſeed, which ſhould be ſown in autumn, where they are to remain, and will require no other culture than to thin them where they are too cloſe, and to keep them free from weeds. The third ſort muſt have a light dry ſoil.

ANDUXAR, a city in the province of Andaluſia, in Spain, ſeated on the river Guadalquiver, 25 miles eaſt of Cordova. It is pretty large, indifferently rich, and defended by a good caſtle. It is adorned with handſome churches and ſeveral religious houſes, and inhabited by many families of high rank. The land about it abounds in corn, wine, oil, honey, and fruit of all ſorts; and the inhabitants carry on a conſiderable trade in ſilk. W. Long. 4. 2. N. Lat. 37. 45.

ANDUZE, a town of France in lower Languedoc, ſeated on the river Gardon. It carries on a conſiderable trade in ſerges and woollen cloth. E. Long. 3. 42. N. Lat. 43. 39.

ANEAU (Bartholomew), a native of Bourges in France, a man of eminent learning in the 16th century, educated under Melchior Volmar. He was profeſſor at Lyons where he propagated the doctrines of the Reformation ſecretly for a long time: but on the feſtival of the Holy Sacrament 1565, as the proceſſion was paſſing on towards the college, there was a large ſtone thrown from one of the windows, upon the Hoſt and prieſt who carried it. The people, enraged at this, broke into the college, and aſſaſſinated Mr Aneau, whom they imagined to have been the occaſion, and the college itſelf was ſhut up next day by order of the city.

ANECDOTE, ANECDOTA, a term uſed by ſome authors, for the title of *Secret Hiſtories*; but it more properly denotes a relation of detached and intereſting particulars. The word is Greek ανεκδοτα, q. d. *things not yet known* or *hitherto kept ſecret*. Procopius gives this title to a book which he publiſhed againſt Juſtinian and his wife Theodora; and he ſeems to be the only perſon among the ancients who has repreſented princes ſuch as they are in their domeſtic relation.—Varillas has publiſhed Anecdotes of the Houſe of Medicis.

ANECDOTES is alſo an appellation given to ſuch works of the ancients as have not yet been publiſhed. In which ſenſe, M. Muratori gives the name *Anecdota Græca* to ſeveral writings of the Greek fathers, found in the libraries, and firſt publiſhed by him.—F. Martene has given a *Theſaurus Anecdotarum Novus*, in folio, 5 vols.

ANEE, in commerce, a meaſure for grain, uſed in ſome provinces of France. At Lyons, it ſignifies alſo a certain quantity of wine, which is the load an aſs can carry at once: which is fixed at 80 Engliſh quarts, wine-meaſure.

ANEMOMETER, in mechanics, implies a machine for meaſuring the force and velocity of the wind.

Various machines of this kind have been invented at different times, and by different perſons. The following has been often experienced, and found to anſwer the intention.

An open frame of wood, ABCDEFGHI*, is ſupported by the ſhaft or arbour I. In the two croſs-pieces HK, LM, is moved a horizontal axis QM, by means of the four ſails, *ak*, *cm*, *Of*, *gh*, expoſed to the wind in a proper manner. Upon this axis is fixed a cone of wood, MNO; upon which, as the ſails move round, a weight R, or S, is raiſed by a ſtring round its ſuperfices, proceeding from the ſmaller to the larger end NO. Upon this larger end or baſe of the cone, is fixed a rocket wheel *k*, in whoſe teeth the click X falls, to prevent any retrograde motion from the depending weight.

* Plate XXXI. fig. 3.

The ſtructure of this machine ſufficiently ſhows that it may be accommodated to eſtimate the variable force of the wind; becauſe the force of the weight will continually increaſe as the ſtring advances on the conical ſurface, by acting at a greater diſtance from the axis of motion; conſequently, if ſuch a weight be added on the ſmaller part M, as will juſt keep the machine in equilibrio in the weakeſt wind, the weight to be raiſed as the wind becomes ſtronger, will be increaſed in proportion, and the diameter of the cone NO may be ſo large in compariſon to that of the ſmaller end at M, that the ſtrongeſt wind ſhall but juſt raiſe the weight at the greater end.

If, for example, the diameter of the axis be to that of the baſe of the cone N O as 1 to 28; then, if S be a weight of one pound at M on the axis, it will be equivalent to 28 pounds when raiſed to the greater end: if, therefore, when the wind is weakeſt, it ſupports one pound on the axis, it muſt be 28 times as ſtrong to raiſe the weight to the baſe of the cone. If therefore a line or ſcale of 28 equal parts be drawn on the ſide of the cone, the ſtrength of the wind will be indicated by that number on which the ſtring reſts.

ANEMONE, WIND-FLOWER: A genus of the polygnia order, belonging to the polyandria claſs of plants; and, in the natural method, raking under the 26th order, *Multiſiliquæ*. It has its name from the Greek ανεμος, ſignifying the *wind*; becauſe the flower is ſuppoſed not to open unleſs the wind blows.—The characters are: There is no *calyx*: The *corolla* conſiſts of petals of two or three orders, three in each ſeries, oblongiſh: The ſtamina conſiſts of numerous capillary filaments; the antheræ didymous and erect. The *piſtillum* has numerous germina collected into a head; the ſtyli are pointed; the ſtigmata obtuſe: There is no *pericarpium*; the receptaculum is globular: The *ſeeds* are very numerous.

Of this genus Dr Linnæus enumerates 21 ſpecies; but thoſe valuable on account of the beauty of their flowers, are only the following. 1. The nemoroſa, which grows wild in the woods in many parts of Britain, where it flowers in April and May. The flowers are white, purple, or reddiſh purple, ſometimes ſingle, and ſometimes double, ſo that they make a pretty appearance. 2. The appennina is likewiſe a native of Britain, growing in woods. The flowers of this ſpecies, like the laſt, are ſometimes ſingle, and ſometimes double; their colours are white, blue, or violet. They appear in April. 3. The coronaria. 4. The hortenſis. Theſe two are natives of the Levant, particularly of the Archipelago iſlands, where the borders of the fields are covered with them of the moſt beautiful colours. When they grow wild, the flowers are commonly ſingle; but by culture they are greatly improved: they become large and double, making ſome of the greateſt ornaments of gardens. Their principal colours are red, white, purple, and blue; ſome of them are finely variegated with red, white, purple, and many intermediate ſhades of theſe colours.

Culture. The firſt and ſecond ſorts may be propagated by taking up their roots when the leaves decay, and tranſplanting them in wilderneſſes, where they will thrive and increaſe greatly, if they are not diſturbed. The two laſt ſorts require a good deal of care, and ample directions for their culture.—The ſoil in which theſe flowers will thrive extremely, may be compoſed in the following manner: Take a quantity of freſh untried earth (from a common or ſome other paſture land) that is of a light ſandy loam or hazel mould, obſerving not to take it above ten inches deep below the ſurface; and if the turf be taken with it, the better, provided it hath time to rot thoroughly before it is uſed: mix this with a third part of rotten cow-dung, and lay it in a heap, keeping it turned over at leaſt once a month for eight or ten months, the better to mix it, and rot the dung and turf, and to let it have the advantages of the free air. In doing this work, be careful to rake out all the great ſtones, and break the clods; but by no means ſift or ſcreen the earth, which has been found very hurtful to many ſorts of roots. This earth ſhould be mixed twelve months before it is uſed, if poſſible: but if conſtrained to uſe it ſooner, it muſt be the oftener turned over, to mellow and break the clods; obſerving to rake out all the parts of the green ſwaird that are not quite rotten, before it is uſed, as they would be prejudicial to the roots if ſuffered to remain. The beginning of September is a proper ſeaſon to prepare the beds for planting, which (if in a wet ſoil) ſhould be raiſed with this ſort of earth ſix or eight inches above the ſurface of the ground, laying at the bottom ſome of the rakings of the heap to drain off the moiſture; but, in a dry ſoil, three inches above the ſurface will be ſufficient; this compoſt ſhould be laid at leaſt two feet and a half thick, and in the bottom there ſhould be about four or five inches of rotten neats dung, or the rotten dung of an old melon or cucumber bed. The beds muſt be laid (if in a wet ſoil) a little round, to ſhoot off the water; but in a dry one, nearer to a level. In wet land, where the beds are raiſed above the ſurface, it will be proper to fill up the paths between them, in winter, either with rotten tan or dung, to prevent the froſt from penetrating into the ſides of the beds, which otherwiſe may deſtroy their roots. The earth ſhould be laid in the beds at leaſt a fortnight or three weeks before the roots are planted, and a longer time would be yet better, that it may ſettle; and when they are planted, ſtir the upper part of the ſoil about ſix inches deep, with a ſpade; then rake it even and ſmooth, and with a ſtick draw lines each way of the bed at ſix inches diſtance, ſo that the whole may be in ſquares, that the roots may be planted regularly: then with three fingers make a hole in the centre of each ſquare, about three inches deep, laying therein a root with the eye uppermoſt; and when the bed is finiſhed, with the head of the rake draw the earth ſmooth, ſo as to cover the crown of the roots about two inches thick.

The beſt ſeaſon for planting theſe roots, if for forward flowers, is about the latter end of September, and for thoſe of a middle ſeaſon any time in October: but obſerve to perform this work, if poſſible, at or near the time of ſome gentle ſhowers; for if planted when the ground is perfectly dry, and there ſhould no rain fall for three weeks or a month after, the roots will be very apt to grow mouldy upon the crown; and if once they get this diſtemper, they ſeldom come to good after.

As all the fine varieties of theſe flowers were firſt obtained from ſeeds, ſo no good floriſt that hath garden-room ſhould neglect to ſow them; in order to which, he ſhould provide himſelf with a quantity of good roots of the ſingle (or what the gardeners call *poppy*) anemonies, of the beſt colours, and ſuch as have ſtrong ſtems and large flowers, but eſpecially ſuch as have more leaves than common, and alſo other good properties: theſe ſhould be planted early, that they may have ſtrength to produce good ſeeds, which will be ripe in three weeks or a month's time after the flowers are paſt; when the ſeeds muſt be carefully gathered, otherwiſe they will be blown away in a ſhort time, as being incloſed in a downy ſubſtance. You muſt preſerve this ſeed till the beginning of Auguſt, when you may either ſow it in pots, tubs, or a well-prepared bed of light earth : in the doing of it you muſt be careful not to let your ſeeds be in heaps ; to avoid which, the beſt method is to mix them with a little fine ſand, and, when ſown, gently ſtreak the bed with a ſtrong hair-bruſh.

In about two months after ſowing, the plants will begin to appear, if the ſeaſon has proved favourable. The firſt winter after their appearing above ground, they are ſubject to injuries from hard froſts, or too much wet, againſt both of which you muſt equally defend them : for the froſt is very apt to looſen the earth, ſo that the young plants are often turned out of the ground, after which a ſmall froſt will deſtroy them ; and too much wet often rots their tender roots, ſo that all your former trouble may be loſt in a ſhort time for want of care in this particular : nor is any thing more deſtructive to theſe tender plants than the cold black froſts and winds of February and March, from which you muſt be careful to defend them, by placing a low reed-fence on the north and eaſt ſides of the bed, which may be moveable, and only faſtened to a few ſtakes to ſupport it for the preſent, and may be taken quite away as the ſeaſon advances, or removed to the ſouth and weſt ſides of the bed, to ſcreen it from the violence of the ſun, which often impairs theſe plants when young. As the ſpring advances, if the weather ſhould prove dry, you muſt gently refreſh them with water, which will greatly ſtrengthen roots ; and when the green leaves are decayed, if your roots are not too thick to remain in the ſame bed another year, you muſt clear off all the weeds and decayed leaves from the bed, and ſift a little more of the ſame prepared good earth, about a quarter of an inch thick over the ſurface, and obſerve to keep them clear from weeds during the ſummer ſeaſon, and at Michaelmas repeat the ſame earthing ; but as theſe roots ſo left in the ground will come up early in the autumn, the beds ſhould be carefully covered in froſty weather, otherwiſe their leaves will be injured, whereby the roots will be weakened, if not deſtroyed. If your roots ſucceed well, many of them will flower the ſecond year, when you may ſelect all ſuch as you like, by marking them with a ſtick : but you ſhould not deſtroy any of them till after the third year, when you have ſeen them blow ſtrong, at which time you will be capable to judge of their goodneſs ; for until the roots have acquired ſtrength, the flowers will not ſhow themſelves to advantage.

The ſingle (or poppy) anemonies will flower moſt part of the winter and ſpring, when the ſeaſons are favourable, if they are planted in a warm ſituation, at which time they make a fine appearance ; therefore deſerve a place in every flower-garden, eſpecially as they require little culture. There are ſome fine blue colours amongſt theſe ſingle anemonies, which, with the ſcarlets and reds, make a beautiful mixture ; and as theſe begin flowering in January or February, when the weather is cold, they will continue a long time in beauty, provided the froſt is not too ſevere, or if they are covered with mats. The ſeeds of theſe are ripe by the middle or end of May ; and muſt be gathered daily as they ripen, otherwiſe they will be ſoon blown away by the winds.

Horned cattle, when removed from the higher grounds into woods and woody paſtures, frequently eat the wood-anemone ; and, according to Linnæus and Gunner, many obſervations have proved that it cauſes the bloody flux among them.

Sea-ANEMONE. See *ANIMAL-Flower.*

ANEMOSCOPE, a machine that ſhows either the courſe or velocity of the wind. (See alſo the article *Wind-*GAUGE.)

The machine which ſhows the courſe of the wind, or from what point of the compaſs it blows, conſiſts of an index moving about an upright circular plate, like the dial of a clock, on which the 32 points of the compaſs are drawn inſtead of the hours. The index, which points to the diviſions on the dial, is turned by a horizontal axis, having a trundle-head at its external extremity. This trundle-head is moved by a cog-wheel on a perpendicular axis ; on the top of which a vane is fixed, that moves with the courſe of the wind, and puts the whole machine in motion. The whole contrivance is extremely ſimple ; and nothing required in the conſtruction, but that the number of cogs in the wheel, and rounds in the trundle head, be equal ; becauſe it is neceſſary, that, when the vane moves entirely round, the index of the dial alſo make a complete revolution.

The anemoſcope, calculated for indicating the force or velocity of the wind, is the ſame with what moſt writers call an *anemometer* ; and we have accordingly deſcribed one of thoſe machines under that article. We ſhall here add another, contrived by the late Mr Pickering, and publiſhed in the *Philoſophical Tranſactions*, N° 473.

This anemoſcope is a machine four feet and a quarter high, conſiſting of a broad and weighty pedeſtal, a pillar faſtened into it, and an iron axis of about half an inch diameter faſtened into the pillar. Upon this axis turns a wooden tube ; at the top of which is placed a vane, of the ſame materials, 21 inches long, conſiſting of a quadrant, graduated, and ſhod with an iron rim, notched to each degree ; and a counterpoiſe of wood, as in the figure, on the other. Through the centre of the quadrant runs an iron pin, upon which are faſtened two ſmall round pieces of wood, which ſerve as moveable radii to deſcribe the degrees upon the quadrant, and as handles to a velum or ſail, whoſe pane is one foot ſquare, made of canvas, ſtretched upon four battens, and painted. On the upper batten, next to the ſhod rim of the quadrant, is a ſmall ſpring which catches at every notch correſponding to each degree, as the wind ſhall, by preſſing againſt the ſail, raiſe it up ; and prevents the falling back of the ſail, upon the leſſening of the force of the wind. At the bottom of the wooden tube, is an iron index, which moves round a circular piece of wood faſtened to the top of the pillar on the pedeſtal, on which are deſcribed the 32 points of the compaſs. The figure of this machine is given on Plate XXXI. fig. 4. where *a* is the pedeſtal ; *b*, the pillar on which the iron axis is fitted ; *c*, the circle of wood, on which are deſcribed the 32 points of the compaſs ; *e*, the wooden tube upon its axis ; *f*, the velum ; *g*, the graduated quadrant ; *h*, the counterpoiſe of the vane. The adjoining figure repreſents the velum, which takes off : *a* is the plane of the velum ; *b*, the ſpring ; *c c*, the wooden radii ; *d*, *d*, the holes through which the pin in the centre of the quadrant goes. Its uſes are the following.

1. Having a circular motion round the iron axis, and being furniſhed with a vane at top, and index at the bottom, when once you have fixed the artificial cardinal points, deſcribed on the round piece of wood, on the pillar, to the ſame quarters of the heavens, it gives a faithful account of that quarter from which the wind blows. 2. By having a velum or ſail elevated by the wind along the arch of the quadrant to an height proportionable to the power of the column of wind preſſing againſt it, the relative force of the wind, and its comparative power, at any two times of examination, may be accurately taken. 3. By having a ſpring fitted to the notches of the iron with which the quadrant is ſhod, the velum is prevented from returning back upon the fall of the wind; and the machine gives the force of the higheſt blaſt, ſince the laſt time of examination, without the trouble of watching it.

The ingenious contriver of this machine tells us, that he carefully examined what dependence may be had upon it, during the ſtorms of February 1743-4, and found that it anſwered exceedingly well; for that, in ſuch winds as the ſailors call *violent ſtorms*, the machine had ſix degrees to ſpare for a more violent guſt, before it comes to a horizontal poſition. It is certainly to be depended upon in ordinary weather, the velum being hung ſo tenderly as to feel the moſt gentle breeze. There is, however, reaſon to fear, that the expoſing the anemoſcope to all winds for a continuance, muſt diſorder it, eſpecially irregular blaſts and ſqualls. It may not therefore be amiſs, in violent weather, for the obſerver to take the tube with its vane and velum in his hand, in order to know the force of the wind; and, when he has finiſhed his obſervations, to carry the machine into the houſe, till the violence of the ſtorm is abated, when it may be replaced in its former ſituation.

ANETHUM, DILL and FENNEL: A genus of the digynia order, belonging to the pentandria claſs of plants; and, in the natural method, ranking under the 45th order, *Umbellatæ*. The eſſential characters are: The fruit is oval, compreſſed, ſtriated; and the petals (five) are involute, entire, and very ſhort.

Species. 1. The graveolens, or dill, is an annual plant: the root is long, ſlender, and white; the leaves are divided into a multitude of fine, long, narrow ſegments, like thoſe of fennel, but of a bluiſh green colour, and leſs ſtrong ſmell. The ſtalk is round and firm, growing to the heighth of four feet, with yellow flowers in moderately large umbels. 2. The feniculum, or fennel; of which there are two varieties, the common and the ſweet. The ſweet fennel is ſmaller in all its parts than the common, except the ſeeds, which are conſiderably larger. The ſeeds of the two ſorts differ likewiſe in ſhape and colour; thoſe of the common are roundiſh, oblong, flattiſh on one ſide, and protuberant on the other, of a dark almoſt blackiſh colour; thoſe of the ſweet are longer, narrower, not ſo flat, generally crooked, and of a whitiſh or pale yellowiſh colour. Both ſorts are cultivated in gardens: the common is a perennial plant: the ſweet fennel periſhes after it has given ſeed.

Medicinal Uſes. 1. Of the firſt ſpecies, *dill*, only the ſeeds are uſed. They are of a pale yellowiſh colour, in ſhape nearly oval, convex on one ſide, and flat on the other. Their taſte is moderately warm and pungent; their ſmell aromatic, but not of the moſt agreeable kind. Several preparations of them are kept in the ſhops. They are recommended as a carminative, in flatulent colics, proceeding from a cold cauſe or a viſcidity of the juices.—2. Of *fennel* both the ſeeds and roots are uſed in medicine. The ſeeds of both the fennels have an aromatic ſmell, and a moderately warm pungent taſte: thoſe of the ſweet fennel are in flavour moſt agreeable, and alſo have a conſiderable degree of ſweetneſs; hence the uſe of theſe only have been directed. They are ranked among the four greater hot ſeeds, and not undeſervedly looked upon as good ſtomachics and carminatives. A ſimple water is prepared from them in the ſhops; they are ingredients alſo in the compound ſpirit of juniper, and ſome other officinal compoſitions. The root is far leſs warm, but has more of a ſweetiſh taſte, than the ſeeds; it is one of the five roots called *openers;* and has ſometimes been directed in aperient apozems. Boerhaave ſays, that this root agrees in taſte, ſmell, and medical qualities, with the celebrated *ginſeng* of the Chineſe; from which, however, it appears to be very conſiderably different.—The leaves of fennel are weaker than either the roots or ſeeds, and have rarely been employed for any medicinal uſe.

ANEURISM, in ſurgery, a throbbing tumour, diſtended with blood, and formed by a dilatation or rupture of an artery. See SURGERY-*Index*.

ANGARI, or ANGARII, in antiquity, denote public couriers appointed for the carrying of meſſages. The ancient Perſians, Budæus obſerves, had their αγγαρειον δρομημα; which was a ſet of couriers on horſeback, poſted at certain ſtages or diſtances, always in readineſs to receive the diſpatches from one, and forward them to another, with wonderful celerity, anſwering to what the moderns call *poſts*, q. d. *poſiti*, as being poſted at certain places or ſtages.—The angari were alſo called by the Perſians *aſtandæ;* by the Greeks ημεροδρομοι, on account of the long journeys they made in one day, which, according to Suidas, amounted not to leſs than 1500 ſtadia.

ANGARIA, in Roman antiquity, a kind of public ſervice impoſed on the provincials, which conſiſted in providing horſes and carriages for the conveyance of military ſtores, and other public burdens. It is ſometimes alſo uſed for a guard of ſoldiers, poſted for the defence of a place. In a more general ſenſe, it is uſed for any kind of oppreſſion or ſervices performed through compulſion.

ANGAZYA, one of the Comorra iſlands, lying between the north end of Madagaſcar and the coaſt of Zanguebar in Africa, from Lat. 10° to 15° S. It is inhabited by Moors, who trade with divers parts of the continent, in cattle, fruits, and other commodities of the iſland; which they exchange for callicoes and other cotton cloths. The houſes are built of ſtone, and lime made of calcined oyſter-ſhells; with which the walls and roof are plaſtered in a very elegant manner. The government of Angazya is a pure ariſtocracy; the iſland being ſubject to 10 lords, who have all the title of *Sultan*. The people are very careful of their women; never permitting ſtrangers to ſee them, without permiſſion from a ſultan, or an order which the ſtranger brings with him. Many of them read and write Arabic with great facility; and ſome even underſtand Portugueſe, which they learn from their intercourſe with Moſambique, whither they trade in veſſels of 40 tons burthen.

ANGEIOTOMY, in ſurgery, implies the opening a vein or artery, as in bleeding; and conſequently includes both arteriotomy and phlebotomy.

ANGEL, a ſpiritual intelligent ſubſtance, the firſt in rank and dignity among created beings. The word *Angel* is Greek, and ſignifies a *Meſſenger*: the Hebrew מלאך ſignifies the ſame thing. The angels are in Daniel (chap. iv. ver. 13, &c.) called עירים, or *Watchers*, from their vigilance: for the ſame reaſon they are, in the remains we have of the prophecy attributed to Enoch, named *Egregori*; which word imports the ſame in Greek.

Angels, therefore, in the proper ſignification of the word, do not import the nature of any being, but only the office to which they are appointed, eſpecially by way of meſſage, or intercourſe between God and his creatures; in which ſenſe they are called the *miniſters of God*, who do his pleaſure, and *miniſtring ſpirits* ſent forth to miniſter for them who ſhall be heirs of ſalvation. That there are ſuch beings as we call *angels*, that is, certain permanent ſubſtances, inviſible, and imperceptible to our ſenſes, endued with underſtanding and power ſuperior to that of human nature, created by God, and ſubject to him as the ſupreme Being; miniſtring to his divine providence in the government of the world by his appointment, and more eſpecially attending the affairs of mankind; is a truth ſo fully atteſted by Scripture, that it cannot be doubted. Nay, the exiſtence of ſuch inviſible beings was generally acknowledged by the ancient heathens, though under different appellations: the Greeks called them *dæmons*; and the Romans *genii*, or *lares*. Epicurus ſeems to have been the only one among the old philoſophers who abſolutely rejected them. Indeed, the belief of middle intelligences influencing the affairs of the world, and ſerving as miniſters or interpreters between God and man, is as extenſive as the belief of a God; having never, ſo far as we know, been called in queſtion by thoſe who had any religion at all.

When created.

The creation of angels is not indeed expreſsly mentioned by Moſes in the firſt of Geneſis, yet it is generally conſidered by judicious expoſitors as implied. The reaſon why the ſacred hiſtorian is ſilent on this ſubject, is ſuppoſed by Berrington to be the natural proneneſs of the Gentile world, and even of the Jews, to idolatry *. And it is thought, if they worſhipped mere material elements, which was the caſe, much more might they be inclined to worſhip ſuch ſuperior and ſublime beings as angels. But a better reaſon is perhaps given by other writers, viz. that this firſt hiſtory was purpoſely and principally for information concerning the viſible world; the inviſible, of which we know but in part, being reſerved for a better life †.

On what day they were created has been matter of conjecture. It is a point on which learned men have differed. The Socinians, indeed, hold, ſays biſhop Hopkins ‡, that it was long before the account given by Moſes, but it muſt have been within the ſix days creation; becauſe, as we are informed, that within this ſpace God made heaven and earth, and all things that are therein. All the writers that we have ſeen on this ſubject, think they were included in the firſt day's work, when the heavens were framed.

It has been thought by ſome perſons, that the words of Job, "When the morning ſtars ſang together, and all the ſons of God ſhouted for joy," militate againſt the creation of angels within the ſix days. About the meaning of theſe words, however, expoſitors are not agreed; but admitting that they refer literally to angels, Dr Lightfoot, Caryl, and others, ſee no difficulty in the paſſage. The Doctor thinks they were created on the firſt day, with the heavens; and that they were ſpectators of God's works in the other parts of creation, and praiſed and magnified the Lord for his works all along; ſinging and ſhouting when God laid the foundation of the earth, as the Jews did at the laying the foundation of the temple, Ezra iii.

On a ſubject of this nature it would be imprudent to *indulge* a ſpirit of conjecture: Scripture is the only ſtandard by which truth and error can be tried, and to this we muſt ultimately appeal. It is acknowledged that Moſes has not expreſsly mentioned angels by name; yet as we have remarked, their creation is undoubtedly implied: for the heavens muſt include all that are in them; and therefore it is that the divine penman ſays, in the concluſion of his narrative, "Thus the heavens and the earth were finiſhed, and *all* the hoſt of them." Of the *hoſts* of heaven, the angels muſt form a conſiderable part; they are expreſsly called the *heavenly hoſt*, and the *armies of heaven*, Dan. iv. 35. Luke ii. 13. And if divine authority be admitted as deciſive, the reaſons adduced by Jehovah for the ſanctification of a ſabbath, demonſtrate that they did not exiſt previous to the creation of the heavens. It is, ſurely, aſſerted with propriety, that in *ſix days* the Lord made heaven and earth, the ſea, and ALL that *in them is*. Similar to which is a declaration of the divine hiſtorian relating to the ſame fact.—"And God bleſſed the ſeventh day and ſanctified it; *becauſe* that in it he had reſted from ALL his work which God created and made," Gen. ii. 3. Now if angels exiſted prior to the ſix days of creation, the language of Moſes is far from being accurate and intelligible; and eſpecially when it is conſidered that the obſcurity might have been removed by adding, "from all the work which God had *then* created and made."

But if angels were created before the heavens, where could they exiſt? For, as the learned Gill § has remarked, "though angels have no bodies, and ſo are not in place circumſcriptively; yet as they are creatures, they muſt have an *ubi*, a ſomewhere, in which they are definitively; ſo that they are here, and not there, and much leſs every where: Now where was there an *ubi*, a ſomewhere, for them to exiſt in, before the heavens and the earth were made? It is moſt reaſonable, therefore to conclude, that as God prepared an habitation for all the living creatures before he made them: as the ſea for the fiſhes, the expanſe, or air, for the fowls, and the earth for men and beaſts; ſo he made the heavens firſt, and then the angels to dwell in them."

That this was the fact, will appear very evident, if the words of Moſes be impartially conſidered. "In the beginning (ſays he), God created the heavens and the earth;" which words muſt refer to either the beginning of *creation* or of *time*: if to the former, and angels previouſly exiſted, the language is neither *intel-*

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* On the Creation, p. 81. See alſo Severianus on the Creation.

† Aſſembly's Annot. on Gen. i. 30.

‡ Works, p. 505.

§ Bod. Divin. vol. i. p. 422

ligible nor conformable to *truth*: if to the latter, the difficulty remains; for what is time but the meaſure of created exiſtence. "Time (ſays the judicious Charnock*) began with the foundation of the world: before the beginning of the creation and the beginning of time, there could be nothing but eternity; nothing but what was uncreated, that is, nothing but what was without beginning." But if angels were in a pre-exiſtent ſtate, the hiſtorian's language is unaccountably ſtrange and inaccurate: for if the phraſe *in the beginning*, which is remarkably emphatical, refer to the creation of the heavens and the earth *only*, they are unhappily expreſſed; ſo expreſſed, indeed, as to convey no meaning to thoſe who conſider words as the vehicle of thought, and as intended to expreſs clearly to others the meaning of the writer. For the *natural obvious* ſenſe is as follows—"In the beginning of the creation of the heavens and the earth, God created the heavens and the earth;" which language is not only a departure from that perſpicuity and preciſion which diſtinguiſh all his narrations, but entirely irrational and abſurd.

* Works, vol. i. 112.

That the words *in the beginning* refer to the firſt creation, cannot be doubted, if it be remembered that JEHOVAH himſelf founds a claim to *eternity* on this very ground: "Before the day was, I am he."—"Before the mountains were brought forth, or ever thou hadſt formed the earth and the world, even from everlaſting to everlaſting, thou art God." Iſa. xliii. 13. Pſ. ix. 2. See alſo Prov. viii. 22, 23. &c. Now there could be no propriety in this kind of reaſoning, if angels or any other creature exiſted before the creation of the world, becauſe all claims to eternity from ſuch premiſes would apply even to Gabriel as well as to JEHOVAH. "Before the world was," is, in Scripture language, a phraſe always expreſſive of eternity; and on this principle the evangeliſt John aſſerts the divinity of Jeſus Chriſt in the firſt chapter of his hiſtory. For this purpoſe he alludes to the words of Moſes, and introduces his divine maſter to notice by celebrating the firſt act of his creative power. "In the beginning (ſays he) was the Word;" that is, Dr Doddrige remarks §, before the foundation of the world, or the firſt production of any creature: and Dr Sherlock ‡ is clearly of opinion, that the words, in their moſt common and uſual acceptation, ſignify the firſt creation of all things, and are a demonſtration of the divinity of Chriſt. Of the ſame mind was Dr Owen. He ſays, that if the phraſe *beginning* does not abſolutely and formally expreſs *eternity*, yet it doth a pre-exiſtence to the whole creation, which amounts to the ſame thing; for nothing can pre-exiſt before all creatures but the nature of God, which is eternal, unleſs we ſuppoſe a creature before the creation of any. But what is meant by this expreſſion is fully declared by other paſſages of Scripture: "I was ſet up from everlaſting, before the *beginning*, or ever the earth was;" "Glorify thou me with thine own ſelf, with the glory which I had with thee before the world was;" both which paſſages not only explain the text, but undeniably prove the pre-exiſtence of Chriſt the ſon of God*. It ſhould be remembered, that, in the paſſage under conſideration, the Evangeliſt's argument for the *divinity* of Jeſus Chriſt is grounded on his pre-exiſting the creation of the world; and it is conſequently aſſerted, that he is the creator of all things: but if angels had a being before the period to which he alludes, the argument loſes all its force, and no more proves the divinity of Chriſt than the divinity of an angel (A).

§ Family Expoſitor.

‡ Script. Proof. of Chriſt's Divin. p. 129. See alſo Whitby on John i. 1.

* On the Trinity, p. 43.

If, therefore, the words of Moſes be impartially viewed in their obvious natural meaning, and compared with other paſſages of Scripture that relate to the ſame ſubject, we have no doubt but every unprejudiced mind will perceive, that as he intended to give a ſummary hiſtory of the creation of all things both in heaven and in earth, he has done it in language intelligible and accurate, and in terms ſufficiently explicit.

Their nature, power, employment, &c.

As to the nature of theſe beings, we are told, that they are ſpirits: but whether pure ſpirits diveſted of all matter, or united to ſome thin bodies, or corporeal vehicles, has been a controverſy of long ſtanding. Not only the ancient philoſophers, but ſome of the Chriſtian fathers were of opinion, that angels were cloathed with ethereal, or fiery, bodies, of the ſame nature with thoſe which we ſhall one day have when we come to be equal to them. But the more general opinion, eſpecially of later times, has been, that they are ſubſtances entirely ſpiritual, though they can at any time aſſume bodies, and appear in human or other ſhapes.

That the angelical powers and abilities vaſtly excel thoſe of man, cannot be denied, if we conſider, that their faculties are not clogged or impeded, as ours are, by any of thoſe imperfections which are inſeparable from corporeal being; ſo that their underſtandings are always in perfect vigour; their inclinations regular; their motions ſtrong and quick; their actions irreſiſtible by material bodies, whoſe natural qualities they can controul, or manage to their purpoſes, and occaſion either bleſſings or calamities, public or private, here below; inſtances of which are too numerous to mention.

Beſides their attendance on God, and their waiting and executing of his commands, they are alſo preſumed to be employed in taking care of mankind and their concerns: and that every man had ſuch a tutelar or guardian angel, even from his birth, was a firm belief and tradition among the Jews; and our Saviour himſelf ſeems to have been of the ſame ſentiment. The heathens were alſo of the ſame perſuaſion, and thought it a crime to neglect the admonitions of ſo divine a guide. Socrates publicly confeſſed himſelf to be under the direction of ſuch an angel, or dæmon, as ſeveral others have ſince done. And in this tutelar genius of each perſon they believed his happineſs and fortune depended. Every genius did his beſt for the intereſt of his client; and if a man came by the worſt, it was a ſign the ſtrength of his genius was inferior to

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(A) Of this Socinus and his followers were aware; and therefore artfully endeavoured to evade the force of the apoſtle's reaſoning, by interpreting the phraſe *in the beginning* either in a figurative ſenſe, or as referring to the beginning of John the Baptiſt's miniſtry. We will only ſubjoin, that we do not remember to have ſeen any writer deviate from the primary obvious meaning of the paſſage, who had not ſome hypotheſis to ſupport inimical to truth.

that of his opponent, that is, of an inferior order; and this was governed by chance. There were ſome genii, whoſe aſcendency was ſo great over others, that their very preſence entirely diſconcerted them; which was the caſe of that of Auguſtus in reſpect of that of Marc Antony: and for the ſame reaſon, perhaps, ſome perſons have wit, and ſpeak well, when others are abſent, in whoſe preſence they are confounded, and out of countenance. The Romans thought the tutelar genii of thoſe who attained the empire, to be of an eminent order; on which account they had great honours ſhown them. Nations and cities alſo had their ſeveral genii. The ancient Perſians ſo firmly believed the miniſtry of angels, and their ſuperintendance over human affairs, that they gave their names to their months, and the days of their month; and aſſigned them diſtinct offices and provinces: and it is from them the Jews confeſs to have received their names of the months and angels, which they brought with them when they returned from the Babyloniſh captivity. After which, we find, they alſo aſſigned charges to the angels, and in particular the patronage of empires and nations; Michael being the prince of the Jews, as Raphael is ſuppoſed to have been of the Perſians.

The Mahometans have ſo great a reſpect for the angels, that they account a man an infidel who either denies their exiſtence, or loves them not. They believe them to be free from ſin, enjoying the preſence of God, to whom they are never diſobedient: that they have ſubtile pure bodies, being created of light; and have no diſtinction of ſexes, nor do they need the refreſhment of food or ſleep. They ſuppoſe them to have different forms and offices: that ſome adore God in ſeveral poſtures; others ſing his praiſes, and intercede for men: ſome carry and encompaſs his throne; others write the actions of men, and are aſſigned guardians to them.

As the number of theſe celeſtial ſpirits is very great, it is likewiſe reaſonable to believe that there are ſeveral orders and degrees among them; which is alſo confirmed by Scripture; whence ſome ſpeculative men have diſtributed them into nine orders, according to the different names by which they are there called; and reduced thoſe orders into three *hierarchies*, as they call them: to the firſt of which belong ſeraphim, cherubim, and thrones; to the ſecond, dominions, virtues, and powers; and to the third, principalities, arch-angels, and angels. They imagine farther, that there are ſome who conſtantly reſide in heaven; others who are miniſters, and ſent forth, as there is occaſion, to execute the orders they receive from God by the former. The Jews reckon but four orders or companies of angels, each headed by an arch-angel; the firſt order being that of Michael, the ſecond of Gabriel, the third of Uriel, and the fourth of Raphael: but though the Jews believe them to be four, yet it ſeems there were rather ſeven. The Perſians alſo held, there were ſubordinate degrees among the angels.

Of the fallen angels.

Although the angels were originally created perfect, good, and obedient to their Maſter's will, yet ſome of them ſinned, and kept not their firſt eſtate, but left their habitation; and ſo, of the moſt bleſſed and glorious, became the moſt vile and miſerable of all God's creatures. They were expelled the regions of light, and caſt down to hell, to be reſerved in everlaſting chains under darkneſs, until the day of judgment. With heaven they loſt their heavenly diſpoſition, which delighted once in doing good and praiſing God; and fell into a ſettled rancour againſt him, and malice againſt men: their inward peace was gone; all deſire of doing good departed from them; and, inſtead thereof, revengeful thoughts and deſpair took poſſeſſion of them, and created an eternal hell within them,

When, and for what offence, theſe apoſtate ſpirits fell from heaven, and plunged themſelves into ſuch an abyſs of wickedneſs and wo, are queſtions very hard, if not impoſſible, to be determined by any clear evidence of Scripture. As to the time, we are certain that it could not be before the ſixth day of creation; becauſe on that day it is ſaid, "God ſaw every thing that he had made, and behold it was very good:" but that it was not long after is very probable, as it muſt have preceded the fall of our firſt parents. Some have imagined it to have been after; and that carnality, or luſting to converſe with women upon earth, was the ſin which ruined them: an opinion (B) built on a miſtaken interpretation of Scripture, as if angels were meant by *the ſons of God* who are ſaid to have begotten the mighty men of old on the daughters of men. Others have ſuppoſed, that the angels, being informed of God's intention to create man after his own image, and to dignify his nature by Chriſt's aſſuming of it, and thinking their glory to be eclipſed thereby, envied man's happineſs, and ſo revolted: and with this opinion that of the Mahometans has ſome affinity; who are taught, that the devil, who was once one of thoſe angels who are neareſt to God's preſence, and named *Azazil*, forfeited paradiſe for refuſing to pay homage to Adam at the command of God. But on what occaſion ſoever it firſt ſhowed itſelf, pride ſeems to have been the leading ſin of the angels; who, admiring and valuing themſelves too much on the excellence of their nature and the height of their ſtation, came at length to entertain ſo little reſpect for their Creator,

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(B) This opinion ſeems to have been originally occaſioned by ſome copies of the Septuagint, which, in the days of St Auſtin, had in this place *the angels of God*. Lactantius ſuppoſes the angels, who were guilty of this enormity, had been ſent down by God to guard and take care of mankind; and being endued with free-will, were charged by him not to forfeit the dignity of their celeſtial nature, by defiling themſelves with the corruptions of the earth; but that the devil at length enticed them to debauch themſelves with women. He adds, that, being not admitted into heaven by reaſon of the wickedneſs into which they had plunged themſelves, they fell down to the earth, and became the devil's miniſters; but that thoſe who were begotten by them, being neither angels nor men, but of a middle nature, were not received into hell, no more than their parents were into heaven. Hence aroſe two kinds of dæmons, celeſtial and terreſtrial. Theſe are unclean ſpirits, the authors of whatever evils are committed, and whoſe prince is the devil. From hence very probably proceeded the notions of *Incubi*, or dæmons who are ſuppoſed to have carnal knowledge of women.

Creator, as to be guilty of downright rebellion and apoſtaſy.

It is certain from Scripture, that theſe fallen angels were in great numbers, and that there was alſo ſome order and ſubordination preſerved among them; one eſpecially being conſidered as their prince, and called by ſeveral names, *Beelzebub*, *Satan*, or *Sammaël* by the Jews; *Ahárimam*, by the Perſians; and *Eblis*, by the Mahometans. Their conſtant employment is, not only doing evil themſelves, but endeavouring by all arts and means to ſeduce and pervert mankind, by tempting them to all kinds of ſin, and thereby bringing them into the ſame deſperate ſtate with themſelves.

Angel is likewiſe a title given to biſhops of ſeveral churches. In this ſenſe is St Paul underſtood by ſome authors, where he ſays, *Women ought to be covered in the church, becauſe of the angels.* The learned Dr Prideaux obſerves, that the miniſter of the ſynagogue, who officiated in offering up the public prayers, being the mouth of the congregation, delegated by them as their repreſentative, meſſenger, or angel, to ſpeak to God in prayer for them, was therefore, in the Hebrew language, called the *angel* of the church; and from thence the biſhops of the ſeven churches of Aſia are, by a name borrowed from the Synagogue, called the *angels* of thoſe churches.

Angel, in commerce, the name of a gold coin formerly current in England. It had its name from the figure of an angel repreſented upon it, weighed four pennyweights, and was twenty-three and a half carats fine. It had different values in different reigns; but is at preſent only an imaginary ſum, or money of account, implying ten ſhillings.

Angel-Fiſh, in ichthyology, a ſpecies of ſqualus. See Squalus.

ANGELIC, or Angelical, ſomething belonging to, or that partakes of the nature of angels. We ſay an *angelical* life, &c. St Thomas is ſtyled the *angelical doctor*. The angelical ſalutation is called by the Romaniſts *Ave Maria*; ſometimes ſimply *angelus*.

Angelic Garment (Angelica veſtis), in ancient times, was a monkiſh garment, which laymen put on a little before their death, that they might have the benefit of the prayers of the monks. It was from them called *angelical*, becauſe they were called *angeli* who by theſe prayers *animæ ſaluti ſuccurrebant*. Hence, where we read the phraſe *monachus ad ſuccurrendum* in old books, it muſt be underſtood of one who had put on the habit when he was at the point of death.

ANGELICA: A genus of the digynia order, belonging to the pentandria claſs of plants; and in the natural method ranking under the 45th order, *Umbellatæ*. The eſſential characters are: The fruit is roundiſh, angled, ſolid, with reflected ſtyli; the corollæ are equal, and the petals incurvated.

Species. 1. The ſativa, or common angelica, which is cultivated in gardens for medicinal uſe, and likewiſe for a ſweetmeat, grows naturally in the northern countries. The root of this ſpecies is brown, oblong, and an inch or two thick, fragrant, and acrid. The leaves are very large, compoſed of pinnated folia, of an oblong oval figure, dentated at the edge, and the odd leaf at the end of the pinna lobated; the ſtalk is round, ſtriated, and as thick as a child's arm. The umbels are very large, and of a globoſe figure; the flowers very ſmall and greeniſh. 2. The arch-angelica is a native of Hungary and Germany. The leaves are much larger than thoſe of the former, and the flowers are yellow. 3. The ſylveſtris grows naturally in moiſt meadows, and by the ſides of rivers, in many parts of Britain; ſo is ſeldom admitted into gardens. 4. The atro-purpurea canadenſis; 5. The lucida canadenſis: Theſe are natives of North America, but have neither beauty nor uſe.

Culture. The common angelica delights to grow in a moiſt ſoil: the ſeeds ſhould be ſown ſoon after they are ripe. When the plants come up about ſix inches high, they ſhould be tranſplanted very wide, as their leaves ſpread greatly. If they are planted on the ſides of ditches or pools of water, about three feet diſtance, they will thrive exceedingly.

Medicinal Uſes. For the purpoſes of medicine, Bohemia and Spain produces the beſt kinds of angelica. The London college direct the roots brought from Spain to be alone made uſe of. Angelica roots are apt to grow mouldy, and to be preyed upon by inſects, unleſs thoroughly dried, kept in a dry place, and frequently aired. It is probable that the roots which are ſubject to this inconvenience might be preſerved, by dipping them in boiling ſpirit, or expoſing them to its ſteam after they are dried.

All the parts of angelica, eſpecially the root, have a fragrant aromatic ſmell, and a pleaſant bitteriſh warm taſte, glowing upon the lips and palate for a long time after they have been chewed. The flavour of the ſeeds and leaves is very periſhable, particularly that of the latter, which, on being barely dried, loſe the greateſt part of their taſte and ſmell: the roots are more tenacious of their flavour, though even theſe loſe part of it upon keeping. The freſh root, wounded early in the ſpring, yields an odorous, yellow juice, which ſlowly exſiccated, proves an elegant gummy reſin, very rich in the virtues of the angelica. On drying the root, this juice concretes into diſtinct moleculæ, which, on cutting it longitudinally, appear diſtributed in little veins: in this ſtate, they are extracted by pure ſpirit, but not by watery liquors.

Angelica is one of the moſt elegant aromatics of European growth, though little regarded in the preſent practice. The root, which is the moſt efficacious part, is uſed in the aromatic tincture; and the ſtalks make an agreeable ſweetmeat.

ANGELICS (Angelici), in church hiſtory, an ancient ſect of heretics, ſuppoſed by ſome to have got this appellation from their exceſſive veneration of angels; and by others from their maintaining that the world was created by angels.

Angelics is alſo the name of an order of knights, inſtituted in 1191, by Angelus Flavius Commenus, emperor of Conſtantinople.

Angelics is alſo a congregation of nuns, founded at Milan in 1534, by Louiſa Torelli, counteſs of Guaſtalla. They obſerve the rule of St Auguſtine.

ANGELITES, in eccleſiaſtical hiſtory, a ſect of Chriſtian heretics, in the reign of the emperor Anaſtaſius, and the pontificate of Symmachus, about the year 494, ſo called from Angelium, a place in the city of Alexandria, where they held their firſt meetings. They were called likewiſe *Severites*, from one Severus, who was the head of their ſect; as alſo *Theodoſians*, from one among them named Theodoſius, whom they made pope at Alexandria. They held, that the perſons of the Trinity are not the ſame; that none of them exiſts of himſelf, and of his own nature; but that there is a common god or deity exiſting in them all, and that each is God, by a participation of this deity.

ANGELO (Michael). There were five celebrated Italian painters of this name, who flouriſhed in the 15th and 17th centuries; but the two moſt diſtinguiſhed of them are theſe.—Firſt, Michael Angelo Buonarroti, who was a moſt incomparable painter, ſculptor, and architect, born in 1474, in the territory of Arezzi in Tuſcany. He was the diſciple of Dominico Ghirlandaio; and erected an academy of painting and ſculpture in Florence, under the protection of Lorenzo di Medicis; which, upon the troubles of that houſe, was obliged to remove to Bologna. About this time he made an image of Cupid, which he carried to Rome, broke off one of its arms, and buried the image in a place he knew would ſoon be dug up, keeping the arm by him. It was accordingly found, and ſold to Cardinal St Gregory for an antique; until Michael, to their confuſion and his own credit, diſcovered his artifice, and confirmed it by the deficient arm which he produced: it is rather unuſual for the manufacturers of antiques to be ſo ingenuous. His reputation was ſo great at Rome, that he was employed by pope Sixtus to paint his chapel; and by the command of Pope Paul III. executed his moſt celebrated piece *The laſt judgment.* He has the character of being the greateſt deſigner that ever lived; and it is univerſally allowed that no painter ever underſtood anatomy ſo well. He died immenſely rich at Rome, in 1574.—Secondly, Michael Angelo de Caravaggio, born at that village in Milan, in 1569. He was at firſt no more than a bricklayer's labourer: but he was ſo charmed with ſeeing ſome painters at work, that he immediately applied himſelf to the art; and made ſuch a progreſs in a few years, that he was admired as the author of a new ſtyle in painting. It was obſerved of Michael Angelo Buonarotti, that he was incomparable in deſigning, but knew little of colouring; and of Caravaggio, that he had as good a goût in colouring as he had a bad one in deſigning. There is one picture of his in the Dominican church at Antwerp, which Reubens uſed to call his maſter. It is ſaid of this painter, that he was ſo ſtrangely contentious, that the pencil was no ſooner out of his hand but his ſword was in it. He died in 1609.

ANGELO (St) a ſmall but ſtrong town of Italy, in the Capitanata. There are ſeveral other towns and caſtles of the ſame name in Italy, and particularly the caſtle of St Angelo at Rome. E. Long. 15. 56. N. Lat. 41. 43.

ANGELOS (Los), a province of Mexico, the ancient republic of Tlaſcala, of which a city called *Tlaſcala* was once the capital. That city is now reduced to an inconſiderable village, and has given place to another called *Puebla des los Angelos,* or the city of Angels. It is ſituated in W. Long. 103. 12. and N. Lat. 19. 13. It was formerly an Indian town; but in 1530 was entirely abandoned by the natives, on account of the cruelties of the Spaniards. A ſucceeding viceroy of Mexico, by a milder treatment, recalled them; and the town is now exceedingly rich and populous, ſo as even to vie with Mexico itſelf in magnificence. It is ſituated on the river Zacatula, in a fine valley, about 25 leagues to the Eaſtward of Mexico. In the middle is a beautiful and ſpacious ſquare, from whence run the principal ſtreets in direct lines, which are croſſed by others at right angles. One ſide is almoſt entirely occupied by the magnificent front of the cathedral; while the other three conſiſt of piazzas, under which are the ſhops of tradeſmen. The city is the ſee of a biſhop, ſuffragan to the archbiſhop of Mexico, and we may form a judgment of the wealth of the place by the revenue of the cathedral and chapter, which amounts to 300,000 pieces of eight annually. It muſt be remembered, however, that in popiſh countries the wealth of the laity by no means bears a due proportion to that of the clergy. What contributes greatly to increaſe the riches of this province is, that here is ſituated the city of Vera Cruz, the natural centre of all the American treaſures belonging to Spain. See VERA CRUZ.

ANGELOT, an ancient Engliſh gold coin, ſtruck at Paris, while under ſubjection to the Engliſh. It was thus called from the figure of an angel ſupporting the eſcutcheon of the arms of England and France. There was another coin of the ſame denomination ſtruck under Philip de Valois.

ANGELOT is alſo uſed in commerce to denote a ſmall fat, rich ſort of cheeſe, brought from Normandy. Skinner ſuppoſes it to have been thus called from the name of the perſon who firſt made it up in that form, and perhaps ſtamped it with his own name. Menage takes it to have been denominated from the reſemblance it bears to the Engliſh coin called *angelot.* It is made chiefly in the Pays de Bray, whence it is alſo denominated *angelot de Bray.* It is commonly made in vats, either ſquare or ſhaped like a heart.

ANGER, a violent paſſion of the mind, conſiſting in a propenſity to take vengeance on the author of ſome real or ſuppoſed injury done the offended party.

Anger is either deliberative or inſtinctive; and the latter kind is raſh and ungovernable, becauſe it operates blindly, without affording time for deliberation or foreſight. Biſhop Butler very juſtly obſerves, that anger is far from being a ſelfiſh paſſion, ſince it is naturally excited by injuries offered to others as well as to ourſelves; and was deſigned by the Author of nature not only to excite us to act vigorouſly in defending ourſelves from evil, but to intereſt us in the defence or reſcue of the injured and helpleſs, and to raiſe us above the fear of the proud and mighty oppreſſor.

Neither, therefore, is all anger ſinful: hence the precept, “Be ye angry and ſin not.”—It becomes ſinful, however, and contradicts the rule of ſcripture, when it is conceived upon ſlight and inadequate provocations, and when it continues long. It is then contrary to the amiable ſpirit of charity, which “ſuffereth long, and is not eaſily provoked.” Hence theſe other precepts, “Let every man be ſlow to anger;” and, “Let not the ſun go down upon your wrath.”

Theſe precepts, and all reaſoning indeed upon the ſubject, ſuppoſe the paſſion of anger to be within our power: and this power conſiſts not ſo much in any faculty we have of appeaſing our wrath at the time (for we are paſſive under the ſmart which an injury or affront occaſions, and all we can then do is to prevent its breaking out into action), as in ſo mollifying our minds by habits of juſt reflection, as to be leſs irritated by impreſſions of injury, and to be ſooner pacified.

As reflections proper for this purpoſe, and which may be called the *ſedatives* of anger, the following are ſuggeſted by Archdeacon Paley in his excellent treatiſe of *Moral and Political Philoſophy**—“ The poſſibility of miſtaking the motives from which the conduct that offends us proceeded; how often *our* offences have been the effect of inadvertency, when they were miſtaken for malice; the inducement which prompted our adverſary to act as he did, and how powerfully the ſame inducement has, at one time or other, operated upon ourſelves; that he is ſuffering perhaps under a contrition, which he is aſhamed, or wants opportunity, to confeſs; and how ungenerous it is to triumph by coldneſs or inſult over a ſpirit already humbled in ſecret; that the returns of kindneſs are ſweet, and that there is neither honour, nor virtue, nor uſe, in reſiſting them—for ſome perſons think themſelves bound to cheriſh and keep alive their indignation, when they find it dying away of itſelf. We may remember that others have their paſſions, their prejudices, their favourite aims, their fears, their cautions, their intereſts, their ſudden impulſes, their varieties of apprehenſion, as well as we: we may recollect what hath ſometimes paſſed in our own minds, when we have got on the wrong ſide of a quarrel, and imagine the ſame to be paſſing in our adverſary's mind now; when we became ſenſible of our miſbehaviour, what palliations we perceived in it, and expected others to perceive; how we were affected by the kindneſs, and felt the ſuperiority, of a generous reception and ready forgiveneſs; how perſecution revived our ſpirits with our enmity, and ſeemed to juſtify the conduct in ourſelves which we before blamed. Add to this, the indecency of extravagant anger; how it renders us, whilſt it laſts, the ſcorn and ſport of all about us, of which it leaves us, when it ceaſes, ſenſible and aſhamed; the inconveniences and irretrievable miſconduct into which our iraſcibility has ſometimes betrayed us; the friendſhips it has loſt us; the diſtreſſes and embarraſſments in which we have been involved by it, and the ſore repentance which on one account or other it always coſt us.

“ But the reflection calculated above all others to allay that haughtineſs of temper which is ever finding out provocatives, and which renders anger ſo impetuous, is that which the goſpel propoſes; namely, that we ourſelves are, or ſhortly ſhall be, ſuppliants for mercy and pardon at the judgment-ſeat of God. Imagine our ſecret ſins all diſcloſed and brought to light; imagine us thus humbled and expoſed; trembling under the hand of God; caſting ourſelves on his compaſſion; crying out for mercy—imagine ſuch a creature to talk of ſatisfaction and revenge, refuſing to be intreated, diſdaining to forgive, extreme to mark and to reſent what is done amiſs: imagine, I ſay, this; and you can hardly feign to yourſelf an inſtance of more impious and unnatural arrogance.”

Phyſicians and naturaliſts afford inſtances of very extraordinary effects of this paſſion. Borrichius cured a woman of an inveterate tertian ague, which had baffled the art of phyſic, by putting the patient in a furious fit of anger. Valeriola made uſe of the ſame means, with the like ſucceſs, in a quartan ague. The ſame paſſion has been equally ſalutary to paralytic, gouty, and even dumb perſons; to which laſt it has ſometimes given the uſe of ſpeech. Etmuller gives divers inſtances of very ſingular cures wrought by anger; among others, he mentions a perſon laid up in the gout, who, being provoked by his phyſician, flew upon him, and was cured. It is true, the remedy is ſomewhat dangerous in the application, when a patient does not know how to uſe it with moderation. We meet with ſeveral inſtances of princes to whom it has proved mortal; *e.g.* Valentinian the firſt, Wenceſlas, Matthius, Corvinus king of Hungary, and others. There are alſo inſtances wherein it has produced the epilepſy, jaundice, cholera-morbus, diarrhœa, &c. In fact, this paſſion is of ſuch a nature, that it quickly throws the whole nervous ſyſtem into preternatural commotions, by a violent ſtricture of the nervous and muſcular parts; and ſurpriſingly augments not only the ſyſtole of the heart and of its contiguous veſſels, but alſo the tone of the fibrous parts in the whole body. It is alſo certain, that this paſſion, by the ſpaſmodic ſtricture it produces in the parts, exerts its power principally on the ſtomach and inteſtines, which are highly nervous and membranous parts; whence the ſymptoms are more dangerous, in proportion to the greater conſent of the ſtomach and inteſtines with the other nervous parts, and almoſt with the whole body.—The unhappy influence of anger likewiſe, on the biliary and hepatic ducts, is very ſurpriſing; ſince, by an intenſe conſtriction of theſe, the liver is not only rendered ſcirrhous, but ſtones alſo are often generated in the gall-bladder and biliary ducts: theſe accidents have ſcarce any other origin than an obſtruction of the free motion and efflux of the bile, by means of this violent ſtricture. From ſuch a ſtricture of theſe ducts likewiſe proceeds the jaundice, which in proceſs of time lays a foundation for calculous concretions in the gall-bladder. Laſtly, by increaſing the motion of the fluid, or the ſpaſms of the fibrous parts, by means of anger, a larger quantity of blood is propelled with an impetus to certain parts; whence it happens that they are too much diſtended, and the orifices of the veins diſtributed there opened. It is evident from experience, that anger has a great tendency to excite enormous hæmorrhagies, either from the noſe, the aperture of the pulmonary artery, the veins of the anus; or in women, from the uterus, eſpecially in thoſe previouſly accuſtomed and diſpoſed to ſuch evacuations.

END OF THE FIRST VOLUME.

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* Book III. part ii. chap. 7.

Page.	col.	line.	ERRORS.	CORRECTED.
1	2	6	" litteræ"	" literæ"
—	2	13	" aſſerat"	" aſſerit."
—	2	27	" littera"	" litera"
2	2	43	" Nabad"	" Nadab."
11	2	25	" Maiemen"	" Maimon."
31	2	*marg.*	" des Scavens"	" des Sçavans."
51	2	21	" ferruntur"	" feruntur."
—	2	23	" velitis"	" velites."
59	2	26	" tradunter"	" traduntur."
—	2	28	" ocules"	" oculos."
69	2	40	" mulierus"	" mulieres."
—	2	—	" hominus"	" homines."
82	1	25	" dale"	" deal."
95	2	30	" obſtruſe"	" abſtruſe."
97	1	60	" Feugo"	" Fuego."
108	1	20	" monodelphia"	" monadelphia."
268	1	58	" forty"	" four."
601	1	36	" 70000"	" 7000."
607	1	5	" reproach"	" approach."

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